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Proceedings of the Fortieth Annual Meeting of the American Association of Economic Entomologists

Section of Plant Quarantine and Inspection

Tuesday Morning, December 27, 1927

The meeting of the Section of Plant Quarantine and Inspection, held in connection with the Fortieth Annual Meeting of the American Association of Economic Entomologists, at the Y. M. C. College, Nashville, Tennessee, convened at ten-five o'clock, Mr. J. H. Montgomery presiding.

CHAIRMAN MONTGOMERY: I have two committees to appoint. The Nominating Committee will consist of the following: Lee A. Strong, A. G. Ruggles and R. W. Leiby.

The Resolutions Committee will consist of the following: Richard Faxon, L. S. McLaine and E. L. Chambers.

Any resolutions which this Section desires to have submitted to the parent body should be handled through this committee.

The first thing on the program is an address by the Chairman.

(Published in the Quarterly Bulletin of the Florida State Plant Board.)

C. L. MARLATT: I do not want to discuss the address, but I simply want to say I have listened with a great deal of pleasure, and I am heartily in accord with all of the principles laid down. I think it is a very masterful presentation and a very useful and instructive one for all of us.

I fully appreciate, also, the point the Chairman made relative to the educational work which the state people should do with their representatives in Washington. I am not afraid to say that here or anywhere else, because, after all the Congressmen, the Senators and other representatives you may have in Washington, in the Federal Government, are citizens of your state, interested in your state and your problems,

interested also in national problems. There is no reason why they should not be educated to the needs of the state and nation as well as the rest of us.

E. R. SASSCER: I quite agree with the statements made by Mr. Marlatt. I merely rise to call to your attention one of the problems which plant quarantine officials will undoubtedly have to meet in the future. Just recently I had a communication from the Bureau's representative in charge of the work in Porto Rico, furnishing me with a schedule of the airplane travel between Haiti and Porto Rico. There are some three planes flying between Haiti and Porto Rico weekly. Fortunately, this inspector is on the job. He is working with the customs officials. Up to the present date he has been able to meet all of the airplanes upon arrival. He pointed out, however, that frequently they made a trip in about three hours, and sometimes he had difficulty in getting his men to the landing field. It seems these planes carry from eight to ten passengers, and evidently there is some baggage brought along. As yet he has not detected any fruits or vegetables which would be prohibited.

CHAIRMAN MONTGOMERY: We will now receive reports from the various regional boards. Is Mr. Headlee here? In his absence is there anyone here who can submit a report on the activities of the Eastern Plant Board? (No response).

Mr. Haseman, Will you submit a report from the Central Plant Board, please?

CENTRAL PLANT BOARD

The Central Plant Board held its annual meeting March 4 and 5, 1927 at Madison, Wisconsin with official representatives from Illinois, Indiana, Kansas, Michigan, Minnesota, Missouri and Wisconsin. In the absence of President Ruggles, the writer was elected acting president.

Dr. Fracker presented the report of our representatives on the National Plant Board. This report including a number of recommendations was received and held over for later action. At a later session our Board voted to delay action on the question of assessing fees for establishing a fund for the National Plant Board. It approved the resolution concerning the discontinuing of license fees and bonds required of nurserymen. It approved the National Plant Board's suggestions (1) relative to inspecting nursery stock and attachment of certificate tags; (2) date certificates are to expire; (3) fumigation to be an auxiliary and not a substitute for inspection; (4) inspection of grounds surrounding the nursery; (5) states issuing quarantines to report same to Federal Horticultural Board and to other states interested. It voted to change its name to the Central Plant Board. Our Board adopted a report of a special committee appointed the previous year to draw up recommendations on certification of greenhouse plants and hardy outdoor perennials after the same had been amended at various points. The details of this are on file. Our Board took no action on the suggestion regarding moving forward to 1927 the

conference on rose and fruit stocks announced by the Federal Horticultural Board for 1928. Our Board took further action as follows:

1. Because of the frequent arrival of uncertified shipments of nursery stock from California it was the sense of the members present that such shipments should be returned to the shipper.

2. It was the concensus of opinion that the Supreme Court decision of April 1925 rendered it necessary to reenact only quarantine laws passed subsequent to August 20, 1912 and prior to April 12, 1926, and that states apparently are without authority to prescribe under what conditions nursery stock may be brought into the States.

3. It was the sense of the meeting that corn borer quarantine lines should be completely waived before movement of sweet corn begins in any part of the quarantined area.

4. Recommended to Federal Horticultural Board that corn on the ear be prohibited from moving from heavily to lightly infested areas.

5. Recommended to the Federal Horticultural Board either of the following amendments to quarantine No. 63 whichever is more satisfactory.

a. That uninfected areas be recognized in Minnesota, Wisconsin and Michigan, the same to be separated from infected areas by a safety zone of from 25 to 50 miles and that dormancy, defoliation and dipping in lime sulphur be required in the safety zone and that interstate shipments from uninfected areas be restricted to red, white and Alpine currants and to cultivated gooseberries.

b. In place of requiring the absence of *Ribes nigrum* within one mile of all nurseries receiving permits, a certificate from the state inspector showing that no white pine blister rust has been found nearer than 25 miles within the last 8 years.

6. Resolution passed urging South Dakota Department of Agriculture to establish and enforce a quarantine against known alfalfa weevil infested areas.

7. It was the sense of the meeting that all quarantines should be put on sheets of uniform size to facilitate filing; if mimeographed the regular 8½ x 11 be used; if printed the uniform circular 6 x 9 be used.

In informal discussions our members opposed the suggestion of the western Plant Quarantine Board, that inspection of all nursery stock be made at destination and that certificate tags on shipments be dispensed with.

It was thought that new laws with authority to stop vehicles for inspection might aid in controlling vehicular traffic if such provisions were not declared unconstitutional.

Next meeting of our Board will be held March 1, 2 and 3 in St. Louis, Missouri.

L. HASEMAN, *President, Central Plant Board*

CHAIRMAN MONTGOMERY: The next regional board report will be that of the Southern, Professor Harned.

REPORT OF THE SOUTHERN PLANT BOARD

The Southern Plant Quarantine Board was organized at Atlanta, Georgia, on February 3 to 5, 1926, when twenty of the plant quarantine officials of ten Southern States and Lee Strong of California met at the time of the annual meeting of the Southern Agricultural Workers' Association. The states represented were North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Tennessee, and Arkansas. Oklahoma was the only state in this region not represented.

The minutes of this meeting, as well as a copy of the Constitution and By-Laws, are published in the Quarterly Bulletin of the State Plant Board of Mississippi for April, 1926. This bulletin is available for anyone who may care to obtain it.

The second meeting of the Southern Plant Quarantine Board was held in Atlanta, Georgia, on February 1, 1927. The twenty-five people in attendance represented nine of the eleven states in this region. Arkansas and Oklahoma were the only states not represented.

Dr. Wilmon Newell, Representative on the National Plant Board, discussed fully the work of the National Board, and gave a report of the proceedings of the meeting held in Washington in June 1926. In accordance with a recommendation from the National Board, the Southern Plant Quarantine Board voted to change its name to the Southern Plant Board.

The same officers that had served during 1926 were re-elected for 1927, except that R. E. McDonald of Texas was elected for a two-year period as Representative on the National Plant Board to take the place of George G. Becker of Arkansas who had resigned his position in that state to accept a place with the Federal Horticultural Board.

Although the Southern Plant Board has been in existence for only two years, an informal organization of the quarantine officers and entomologists in this region has been meeting quite frequently for more than twenty years.

R. W. HARNED

CHAIRMAN MONTGOMERY: Mr. Strong will you submit a report from the Western Board?

REPORT OF THE WESTERN PLANT QUARANTINE BOARD

The ninth annual Western Plant Quarantine Board meeting at Reno, Nevada, June 20–21, 1927, was one of the most representative meetings in point of attendance of any held for several years past. There were members from Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, Washington, British Columbia, Hawaii and Lower California, representing twelve of the fourteen states, districts, provinces and territories comprising the Board. In addition, Professor R. W. Harned of Mississippi, President of the American Association of Economic Entomologists, was in attendance and two representatives from the Department of Agriculture and Development of Mexico. The Western Plant Quarantine Transportation Committee had three representatives; namely, the American Railway Express, Southern Pacific and Union Pacific.

Chairman Oscar C. Bartlett, Arizona, in his address, noted first, that the Western Plant Quarantine Board session should extend over a period of time adequate to clear up many of the problems delegated to committees because of the difficulty of committee members getting together between sessions to discuss problems referred to them. Delays and inability to reach definite conclusions until the Board actually met again became apparent. To attempt to discuss matters delegated to them at the annual conference reacted to the disadvantage of the meeting itself. Finances presented a difficulty in bringing committee members together at times between regular board conferences. Secondly, he urged sound consideration of any and all actions on resolutions submitted by the National Plant Board. The Western Plant Quarantine Board should be in a position to give a well weighted and sound response to such matters because of its long experience. Third, he emphasized the importance

of working closely with Mexico and cited the trip made into that country by some of the members of the Western Plant Quarantine Board in September, 1926, as of great mutual benefit.

G. H. Hecke, Director of Agriculture, California, dwelt upon the importance of correlating all plant quarantine work. The Mexican fruit fly situation and the quarantine features involved were stressed and he urged every energy of the Western Plant Quarantine Board to supporting conclusive action toward its elimination from the United States. He pointed out that as a result of the Supreme Court decision we had learned that there were many sides to the quarantine situation and that unsound practices in quarantine could result in nothing but disaster. The importance of the federal government calling quarantine officials together at federal expense, or calling regional groups to discuss specific problems was noted as vital. He also pointed out that an advance in membership fees should be seriously considered in order to help the conclusive work that the Western Plant Quarantine Board was doing within its own jurisdiction and to aid the National Plant Board.

The standing committee on pest surveys reported a plan for consistent reports to be given at each Western Plant Quarantine Board meeting and agreed to correlate such information as to be most advantageous to the membership. The recommendation was:

"(a) Future crop pest list reports shall be tabulated in the following manner:

1. Common name
2. Scientific name
3. Host plants
4. Major or minor pest

(b) That representatives of the Board present at the ninth annual conference who have already submitted lists shall revise the lists submitted to conform to the above recommendation.

(c) That future reports, after one complete list is in the hands of the committee and has been published, need only consist of new or especially prominent pests."

The pest treatments committee reported through D. B. Mackie, California, who outlined methods commonly in vogue in order to arrive at a basis for discussion. Hydrocyanic acid, carbon bisulphide, dips, heat and mechanical means for suppressing pests were discussed. It was contended that the policy of this committee should be to develop methods which would aid in preventing quarantine restrictions interfering with traffic in plant products. The committee was to continue seeking data as to methods in cooperation with all agencies which might have suggestions or facts based on research data available.

Under new topics, W. H. Lyne, British Columbia, suggested that nurserymen be encouraged to hire pest control experts in order to reduce the burden of nursery inspection by regulatory officials and ordinarily aid the nurseryman in his ability to ship clean products.

G. C. Schweis, Nevada, brought up the matter of year-around shipment of alfalfa meal under proper safeguards from alfalfa weevil infested districts. (Note: Resolution passed by the Board forwarded to Washington whence it was learned that the U. S. Bureau of Entomology was delegating certain specific duties with reference to this project to George I. Reeves. He is hopeful of being able to devote full time to developing data with reference to the possibility or impossibility of year-around alfalfa meal shipments from weevil areas through a member of his staff.)

LEE A. STRONG

Reports of the States

Arizona.—Dr. Oscar C. Bartlett.—General pest conditions reported upon and inspection results noted; especially mentioned pink bollworm and Thurberia weevil infestations. In the case of pink bollworm, Dr. Bartlett did not agree with the theory that commercial planting seed was responsible because most of this seed came from Coachella Valley, Calif., an area known to be free of pink bollworm. It may have been bootleg seed. Could not venture any definite opinion as to the possible outcome of injunction proceedings invoked in the Tucson area.

British Columbia.—W. H. Lyne.—*Lecanium corylii* had not spread to any appreciable extent.

Hawaii.—Theo. C. Zchokke.—Reported that Mr. D. T. Fullaway, Chief Inspection Officer for Hawaii, had urged the development of more information on pests of the Pacific Ocean region. Many pests are now known from scientific records but their economic status is unknown or very fragmentarily recorded. The possibility of an organization for such purpose for the Pacific region. He cautioned against fruit flies to the extent that anything and everything that can be done to keep them out should be done regardless of how drastic. No one in Hawaii eats fruit after dark except in good light.

Lower California.—O. A. Pratt.—The governor of the district has taken over the administration of quarantine funds, which funds are derived from a cotton tax. The Camara Agricola, originally instituted to administer this work, has been left without the authority it previously had.

New Mexico.—Dr. H. L. Kent.—Due to illness was unable to attend the New Mexico legislature to present legislation for re-enactment of quarantine authority, although the Board of Regents did have more extensive regulatory powers than normally allotted to the average state agency. He commented very specifically on the value of education of farmers on quarantine matters as a result of the combination of these activities within the College of Agriculture in his state.

Colorado.—Geo. M. List.—Reported on general pest conditions.

Oregon.—Don C. Mote.—Representing Mr. Park, noted the finding of alfalfa weevil in haystacks after they were reported free of this pest.

Utah.—Dr. F. E. Stephens.—Emphasized the importance of weed control.

Washington.—J. I. Griner.—Stressed the importance of gaining additional assistance for European earwig control regardless of whether by bait methods or by biological control. Also the difficulties being encountered in Colorado potato beetle certification of potatoes because of the attitude of ranchers.

California.—W. C. Jacobsen.—Presented a general report as to pest conditions, pest spread, and particularly stressed the white fly program as an example of intensive pest control procedure. The infestations now present were outside of the main citrus producing area and only very limited as to area of spread. Other pest spread was noted.

All of the states reported on new quarantine regulations which had become effective within the year, also action taken by their legislatures in restoring basic quarantine legislation.

A paper prepared by Lee A. Strong, Chairman of the National Plant Board, was read, discussing that organization, its accomplishments and possible effect on the

trend of the quarantine work in the United States. The importance of the National Plant Board was impressively brought out and its relationships to the regional boards, whereby mutual benefits could be derived, were clearly stated. A most important value of the Board seemed to lie in the direction of simplifying the complicated and unwieldy quarantine condition now existing and instilling a uniformity which will redound to the benefit of regulatory work generally. A national survey of the whole quarantine situation can be materially aided by the National Plant Board. Without full coordination in plant quarantine work there is apt to be difficulty ahead for quarantine enforcement in general.

REPUBLIC OF MEXICO.—Dr. Alfons Dampf and E. Coppel Rivas.—Plant quarantine work has received a real recognition in the Republic of Mexico as is manifested by the establishment by presidential decree of the Oficina para la Defensa Agricola (Office of Agricultural Defense) January 1, 1927. This office embodies within it a combination of the duties of Federal Horticultural Board, Bureau of Entomology, the plant disease section of the Bureau of Plant Industry and the pest publication and statistical work found in the United States Department of Agriculture. These men credited the contacts with the Western Plant Quarantine Board and the trip made through Mexico last year by members of the Western Plant Quarantine Board as giving a great impetus to the new start which they had. They have placed the inspection work in the hands of technically trained men and have constructed vacuum fumigation equipment at Guadalajara, part of which was already in operation in June, 1927.

Dr. A. W. Morrill, Dr. O. C. Bartlett and Mr. O. A. Pratt particularly mentioned the need for more Federal Horticultural Board men to do inspection work on the international boundary. Reports indicated that the personnel was not adequate, at least at Nogales, to have inspectors on the job during the entire time when inspections should be made. Dr. Morrill noted having returned from Mexico on the Southern Pacific line on the early morning train through Nogales without inspection being made of his baggage by Federal Horticultural Board men. The reaction of these men who had been in contact with the inspection work through Nogales indicated that it should be considerably more intensive.

THE WESTERN PLANT QUARANTINE BOARD TRANSPORTATION COMMITTEE.—E. E. McMichael, Chairman,—American Railway Express.—This committee continues to offer every assistance in aiding to prevent introduction of injurious insect and disease pests and wants whatever suggestions can be given. A difficulty in connection with transportation was presented by Dr. F. E. Stephens of Utah. The incident specifically mentioned was as follows: A carload of nursery stock starts from an area Utah has under quarantine, moves into another state not maintaining a quarantine against the area of origin. Part of the car is unloaded and the unloaded material replaced with new material at the first destination, which area is not under quarantine by Utah. Therefore, a car billed from the first destination reaches destination in Utah apparently from an unquarantined area, yet a portion of the consignment actually originated in dangerous territory.

BORDER INSPECTION DISCUSSION.—A. C. Fleury, California.—Outlined border station experiences in California. Nearly 9,000 lots of plant products, either contraband, actually infested or refusable because of violation of a quarantine order or regulation, were intercepted. This was contrasted with the interior inspection carried on by the state quarantine guardians where only 1,109 lots were intercepted.

There were 35 men on the job at border stations and approximately 250 men at the interior points. This is not in any sense a reflection on the inefficiency of interior inspection but decidedly points out the importance of border inspection.

During 1925, 3046 alfalfa weevil were taken from 509 automobiles; during 1926, 1,800 live alfalfa weevil were taken from 331 automobiles. It has been shown that weevils are not necessarily picked up in alfalfa fields but very often in rubbish and grass about auto camps located in the general vicinity of alfalfa fields.

The following statement was made in connection with one day's inspection (Feb. 9, 1927) at a southern border station.

"Of 181 autos inspected, 31 carried plant material in violation of the California quarantines. Some of these were:

6 apples from Connecticut
1 Arizona cotton picking bag
1 lot of Mexico sapotes via El Paso (Hosts of Mexican fruit fly)
4 Arizona navel oranges
1 New Mexico orange in a suitcase
2 Florida grapefruit
2 Florida grapefruit
2 pounds Florida sweet potatoes
2 Texas apples
1 Arizona orange
2 Florida oranges
2 Florida lemons
1 Arizona navel orange
2 Arizona picking bags
2 Texas picking bags
12 bolls of Georgia cotton
1 lot Georgia raw cotton
2 Grapefruit from Florida
1 package Spanish moss from Georgia
1 Louisiana kumquat
2 New Mexico raw cotton mattresses
2 New Mexico cotton picking bags

Some of the cars mentioned in the above report originated in the southern states and came through the federal station at Mesilla Park. The contraband carried originated east of this point. In one instance live pink bollworm was taken and a sample for identification forwarded to Washington for identification, confirmed. This may indicate how pink bollworm reached Arizona.

It was recognized that lack of legal authority for federal inspection made it difficult to cover the search as thoroughly as at some of the border stations maintained by the states. Other interceptions briefly touched upon were potted plants from the Japanese beetle area, hosts of the European corn borer from the quarantined area and numerous violations of the white pine blister rust and Gypsy moth quarantines.

(Note: Fleury reports, as a result of a visit to southern border stations in December 1927, that over a period of approximately one month preceding that live boll weevil has actually been found twice at Blythe, twice at Daggett, and twice at Yuma. In two of these instances the cars bearing the contraband came through either a federal vehicular inspection station, a state vehicular inspection station, or one of the cooperative federal state stations maintained in the vicinity of the Arizona-New Mexico line and the cars originated east of these points.)

NARCISSUS BULBS.—Dr. F. R. Cole and C. F. Doucette—U. S. Bureau Entomology.—Discussed the narcissus bulb situation from a technical angle. Mr. Doucette developed the opinion as a result of investigations that the optimum time for treating bulbs on the Pacific Coast varied in accordance with the climatic conditions under which they were produced. Hot water dipping in July in San Diego County was comparable to a date in September for the Northwest. Apparently two or three weeks after the bulbs had reached full maturity was the best time. He indicated

that bulb flies were distinctly more difficult to control than nematode by the hot water treatment. Dr. Cole stated that the lesser bulb flies, were represented by at least two and probably three species.

WHITE PINE BLISTER RUST.—S. N. Wyckoff and C. R. Stillinger, U. S. Office of Blister Rust Control.—Pointed out the present status of this pine, currant and gooseberry infection in the Pacific Northwest. Especially pointed out recent developments in control work and quarantine inspection, with reference to blister rust.

GENERAL TOPICS.—Plant shipments with soil were given consideration. It was pointed out that nematodes, plant disease fungi and bacteria are frequently carried in soil and not revealed by inspection. This was referred to the permanent committee on treatments to gain further data.

APIARY INSPECTION.—Uniformity in quarantine action with reference to apiary matters sought and a special committee to be appointed.

VEGETABLE WEEVIL.—Infestation in California, other states and countries reviewed insofar as data available. California studying the matter and restrictive regulations will be issued as it appears necessary on the basis of the information developed.

Resolutions passed embodied the following thoughts:

1. Commended Secretary Jardine on the retention of restrictive measures against grapes from Spain on account of Mediterranean Fruit Fly.
2. Urged every necessary action on part of Federal Horticultural Board to prevent spread of Mexican Fruit Worm and to stamp out infestation recently found in Texas.
3. Requested the states to guide their quarantine promulgations by the uniform basis of sound investigation and the Federal Horticultural Board to analyze all hazards before relaxing or modifying any federal quarantines.
4. Requested material aid in developing control measures either natural or artificial for European earwig from the U. S. Bureau of Entomology.
5. Recommended a technical international pest commission between the United States and Mexico to study all dangerous pests with reference to gaining full knowledge thereof and as to necessity of quarantine action on same and to recommend in an advisory way to the constituted authorities.
6. Urged additional funds for Federal Horticultural Board for pink bollworm clean up and for adequate maintenance of border and vehicular inspection stations.
7. Recommended closer coordination and greater uniformity in plant quarantine enactment and enforcements through the leadership of the Secretary of Agriculture in calling together chief plant quarantine officials in the United States or sectionally when special emergencies arise, such calling at his discretion and that such officials be made collaborators of the U. S. Department of Agriculture attending any meetings called by the Secretary at federal expense.

The officers elected were:

Chairman, Geo. G. Schweis, Nevada
Vice-Chairman, J. I. Griner, Washington
Secretary, W. C. Jacobsen, California
Representative on National Plant Board, M. L. Dean, Idaho

CHAIRMAN MONTGOMERY: The next will be a report from the National Board by Mr. Wilmon Newell.

THE NATIONAL PLANT BOARD

By WILMON NEWELL, *Gainesville, Florida*

As this Section of the Association was primarily responsible for the creation of the body now known as the National Plant Board and as the latter appears to furnish, for the first time, an effective medium through which state and federal quarantine and inspection activities and policies may be correlated, brief mention of its organization may well be made a part of our records.

The unification or standardization of state and federal quarantine regulations, nursery inspection methods and certification of nursery stock have been the subjects of discussion for many years and particularly so since 1915.

Time forbids reference to the many plans which have been suggested and advocated; hence the present discussion must be confined to those developments which have contributed directly to the organization of the present National Plant Board.

At the Boston meeting of the Association of Economic Entomologists, in December, 1922, emphasis was placed upon the importance of unification of inspection laws and uniform certification. The Section of Horticultural Inspection adopted a resolution endorsing a uniform United States tag for interstate movement of nursery stock and stating that the qualifying inspection should be worked out between the United States Department of Agriculture and the state authorities.[1] At the same meeting a committee, consisting of Messrs. T. J. Headlee, F. M. O'Byrne, G. M. Bentley, Leonard Haseman and E. R. Sasscer, was appointed to formulate plans along the lines called for by the resolution.

At the Cincinnati meeting (1923–24) Dr. Headlee's committee presented a plan which called for a Board to be composed of three representatives from the Federal Horticultural Board and three from state inspection services; this Board to have power to control the inspection of all nurseries and to recommend nursery stock for movement interstate under tags to be issued by the United States Government. This proposal met with much protest from state officials and the committee's report was not adopted. However, the committee was continued.

During the ensuing year, Dr. Headlee's committee sent out questionnaires on the subject to state quarantine and inspection officials and again learned that the states were overwhelmingly opposed to federalization of nursery inspection and certification.

At the Washington meeting (1924–25) of the Association, the committee offered another suggestion, namely, that there be provided (1) a Board of country-wide composition for reviewing and passing on state quarantines affecting the interstate movement of nursery stock (2) Regional Boards for correlation of quarantine and inspection activities and (3) standardization, as far as possible, of regulations. This was satisfactory to the Section of Horticultural Inspection and was adopted.

The Western Plant Quarantine Board was already in existence, having been organized in May, 1919. The Central Plant Board was organized March 6, 1925 and during the same year there was organized the Middle Atlantic and Northeastern States Plant Conference Board. Representatives of these three regional bodies met at Kansas City in December, 1925, and formed a temporary organization.

Quarantine officials of the southern states perfected the organization of the Southern Plant Board at Atlanta in February, 1926.

Each regional organization elects two representatives to the national organization.

[1]Journ. of Ec. Ent., Vol. XVI, p. 167.

While the regional boards were being organized the proposed national body was usually referred to as a "Board of Review," which seemed to express the main original idea in the mind of the Association of Economic Entomologists with reference to the functions of such a body. As the plans progressed it became evident that plant quarantine problems would perhaps assume a greater relative importance in the activities of such a national body than would questions of nursery inspection and certification.

Another question debated at length was whether or not the proposed national body should include in its membership representatives of the federal government or whether it should be, *per se*, an organization representing state departments exclusively. This point was not settled until the eight representatives of the four regional boards met at Washington, June 25, 1926, to perfect the permanent organization. They were of the opinion that the federal government should not have representatives on the Board and a sounding out of the membership of the Federal Horticultural Board disclosed the fact that the latter Board held to the same opinion.

The name of National Plant Board was adopted at the Washington meeting in June, 1926, a constitution was adopted and officers elected. The regional representatives making up this Board were:

Western: Lee A. Strong and M. L. Dean
Eastern: W. A. McCubbin and W. C. O'Kane
Central: Frank N. Wallace and S. B. Fracker
Southern: Geo. G. Becker and Wilmon Newell.

The officers elected were: Lee A. Strong, Chairman, Wilmon Newell, Vice-Chairman and W. A. McCubbin, Secretary.

During 1926 Mr. Becker resigned and R. E. McDonald was appointed in his place. During 1927 Mr. Fracker resigned and A. G. Ruggles was selected to succeed him. Otherwise, the personnel of the Board is the same as it was when organized.

At its meeting in Washington, June 25–26, 1926, the Board went on record as opposing the imposition of inspection and license fees in connection with the inspection and sale of nursery stock. A number of simple, but important, recommendations with reference to the simplification of nursery inspection practices were prepared for transmission to the regional boards. The recommendation was also made that a state considering the issuance of a quarantine or regulation of interest to another state should send notice as far in advance as possible to the Federal Horticultural Board and to others in interest. A committee was appointed to prepare, if possible, a definition of "nursery stock" which could be used uniformly by the states. Joint conferences were held with the Federal Horticultural Board with reference to a number of domestic and foreign quarantines, these conferences making for clarification of a number of important points.

At the third meeting of the Board, held in Washington, May 12–13, 1927, subjects receiving consideration included the Mexican fruit-fly situation in Texas, certification of greenhouse plants, exclusion of certain foreign-grown plants and the occurrence of *Aserica castanea* in New York and Pennsylvania. Steps were inaugurated looking to a definite formulation of the principles which should govern plant quarantines. A joint session was again held with the Federal Horticultural Board at which, among other things, certain aspects of the European corn borer and Japanese beetle quarantines were discussed.

The Federal Horticultural Board has accorded the National Plant Board a most friendly and cordial reception and apparently welcomes the opportunity afforded for discussing, informally, with representatives of the state inspection services, various matters of common interest which arise from time to time.

The National Plant Board does not, in itself, possess any authority and it has no legal status. It has only such authority as may be conferred upon it by its constituent regional boards. It represents, however, the state quarantine and inspection departments of all the states: an active agency to represent them and to carry out their wishes.

The Board is still young but it may confidently be expected to have some weight in matters of policy with reference to both domestic and foreign quarantines and to serve as a clearing house for the various state officials and as a useful correlating agency between the states and the Federal Horticultural Board.

CHAIRMAN MONTGOMERY: All of these reports are now open for discussion.

C. L. MARLATT: With reference to what Mr. Strong said, I am very heartily in favor of getting into any relationship with the plant quarantine authorities of Mexico, which is possible. I agree absolutely with what he said, it can't do any harm, and it may do a lot of good, and certainly it will give them encouragement. We have a lot of problems that we can not work out except with the aid of Mexico. The bollworm is one of them. We are bound to have the bollworm in the United States until Mexico can cooperate in cleaning up.

We have the new problems of the Mexican fruit worm where we want cooperative work. There are other pests in Mexico which we are trying to exclude, and we want to do it fairly. We want them to help us and cooperate with us, so that we can do it without putting undue restrictions on commerce between the two republics. I am very heartily in favor, and I think the Board and Department are heartily in favor of that or any steps in the direction of cooperation, at least in the direction of counsel and conference, with the hope that something good will come from it.

I have listened with much pleasure to the reports of all the boards, and I look for a great deal of usefulness from the boards and the central body. It ought to be in some way a material part of the Federal plant quarantine service. That may come.

CHAIRMAN MONTGOMERY: Is there any further discussion or comment?

LEE A. STRONG: I want to make one thing clear. I mentioned the Mexican situation just to illustrate the general trend, as we see it, toward getting together on the quarantine affairs and uniformity. We had a very hearty response from the Federal Horticultural Board with reference to the recommendations we made to that situation.

I also want to say that the National Plant Board, at its last meeting in Washington, D. C., in June or May submitted certain recommendations to the Federal Horticultural Board, and those recommendations have received the very careful consideration of the Board. We were very much pleased with the consideration given to the recommendations by the Federal Horticultural Board. It showed to us they were certainly welcoming our suggestion and any assistance we might be able to give.

CHAIRMAN MONTGOMERY: Dr. Marlatt will now review the work of the Federal Horticultural Board for the past season.

THE WORK OF THE FEDERAL HORTICULTURAL BOARD IN 1927

By C. L. MARLATT

[Digest Based on Stenographer's Notes.]

A change in organization has been consummated during the past season and another one of primary importance is pending. The work of the Board has been divided into the foreign and domestic fields, and Mr. Sasscer and Mr. Fracker, respectively, have been placed in charge of those divisions.

There is now pending before Congress a recommendation of the department which will bring together the plant quarantine and regulatory work heretofore handled by the Federal Horticultural Board, the Bureau of Entomology, and the Bureau of Plant Industry into a Plant Quarantine and Control Administration, allowing the former bureau to direct its activities toward research work in entomology. This is in line with a similar reorganization of the Bureau of Chemistry a year ago.

Two subjects of importance have come up in the domestic field, namely, the spread of the pink bollworm into southwestern New Mexico and southeastern Arizona, and the Mexican fruit worm invasion of the Lower Rio Grande Valley of Texas.

About ten thousand acres of cotton are involved in the pink bollworm spread to the west and a thoroughgoing cleanup is being made of all the cotton areas of that region. Cotton there is grown only in territories where water can be secured, that is, in isolated valleys between mountain ranges and arid stretches of desert. The work is being done with the help of the deficiency appropriation of $90,000, which became available about the middle of December.

Doctor Baker will discuss the Mexican fruit worm subject in a later paper on this program. The department first received information

regarding the occurrence of this pest in the United States in April. As a result of a conference with Texas officers, the National Plant Board, which was meeting in Washington, and others interested, a program of eradication was determined upon, based on an annual seven-months starvation period to be maintained by eliminating all host fruits in which the fly could breed between the first of March and the first of October. This is the period during which the grapefruit, the important commercial crop of the region, is developing, and throughout most of the period the fruit is too green to be attractive to the fly. During the past year this host-free period was maintained by the owners by picking such fruits as guavas, sour oranges, and peaches from the trees, but the plans for a permanent protective program involve the destruction of such trees as normally produce fruit during the summer host-free period. The owners' cooperation in picking the fruits was secured by active publicity campaigns in May and July, respectively, the second campaign being directed to those fruits which developed after the first one had been completed.

The work of cleanup, which had been urged and started by representatives of the A. & M. College of Texas and by the State Department of Agriculture immediately following the discovery of the pest, was carried forward by a detail of some 15 inspectors from the pink bollworm force of the Federal Horticultural Board, and these inspectors were placed under the immediate direction of Mr. McDonald, of the Texas State Department of Agriculture. This work involved first the elimination and disposal of left-over grapefruit in orchard culls and elsewhere, followed by a cleanup of all summer-ripening fruit, and these phases of the work, lasting through until the first of September, were done without funds and with loaned inspectors, as indicated. The first of September funds to continue the work were obtained from the Bureau of Entomology, and the direction from that time on was turned over to Doctor Baker, working in cooperation with Mr. McDonald, and with the actual transfer of some of the Board's men who had been engaged in the project up to that time. On the assembling of Congress, steps were taken to secure the inclusion in the first deficiency bill of $100,000 to continue the work for the balance of this fiscal year. To avoid changing direction in the midst of the season, the work will be continued under the supervision of Doctor Baker for the Board until July of the next fiscal year, after which it will be taken over fully under the reorganization as a part of the regulatory work of the new Plant Quarantine and Control Administration.

There is no project which the Board and Department have undertaken involving drastic action that has received greater local support or more hearty cooperation. Every effort is being made by the local orchard owners not only to comply with all the provisions of the quarantine and the eradication program, but also to prevent the further smuggling of Mexican fruit across the Border, from which the fruit worm infestation seems in part at least to have arisen.

The date scale eradication project has been revised and put on a much stronger basis. The funds hitherto available have been inadequate to give this work the proper speed and efficiency to bring it to a conclusion within a reasonable time and, in fact, to assure a successful conclusion. The presentation of this matter to the Budget led to the securing in the first deficiency bill of this Congress of an increase of $25,000 for use in large part or, if necessary, altogether during the present fiscal year, with the expectation that provision will be made for a continuation of the work on this larger scale thereafter until eradication has been achieved or until its accomplishment is shown to be impossible.

Three important foreign problems have come up during the year, involving Argentina, Spain, and Italy.

The finding of some fruit infested by fruit flies from Argentina over a year ago raised the question of the possible presence of fruit flies in the Argentine orchard districts. At the request of that government, we agreed to aid Argentina in determining what infestation might exist there. Mr. Kisliuk was assigned by the Board to make this survey and proved to be a very efficient man for that sort of foreign service. He demonstrated to our satisfaction that the infested fruit came from a region in the northern part of Argentina and that the main fruit districts of that country, from which exports are usually made, not only have not been infested by fruit flies, but are so isolated geographically and commercially that they are fairly well protected from invasion by the insects.

This result as to freedom of the main fruit districts of Central Argentina from fruit flies confirmed the results obtained by a similar very thorough field investigation made at the instance of the Board by Mr. Moznette some two years previously. These findings warranted the Department in authorizing the continuance of entry of fruits from these districts, but such entries are conditioned on the Government of Argentina maintaining adequate internal quarantine restrictions to protect these districts and also on the meeting of certain requirements with respect to fruit exports to the United States. These requirements are incorporated in all permits, and are as follows:

1. Shipments shall be certified as to origin by appropriate officers of the Argentine Government.

2. Each crate or container shall be marked to indicate the Province of origin.

3. The shipments shall be safeguarded from point of origin to embarkation at Buenos Aires.

4. Compliance with these conditions shall be the basis of issuance of consular invoice.

5. The shipments shall be subject to thorough inspection by inspectors of this Department upon arrival at New York or other northern port specified in the permit.

6. Refusal of entry shall follow determination of infestation by fruit fly, both as to the shipment in question and as to other shipments from the same district which may be en route, and such refusal of entry shall also follow, as to the Province concerned, any determination of fruit fly infestation which may result from surveys hereafter made.

The result in Argentina encouraged Spain to ask for a similar survey, and Mr. Kisliuk was also assigned to that work.

It will be recalled that Spain has been the subject of two or three rather careful surveys, and that the fruit fly is widely distributed in practically all fruit sections of that country. The conditions, therefore, are widely different from those in Argentina, and in fact there was very little likelihood that a resurvey would show any situation which would warrant any modification of the existing restrictions on the entry of Spanish fruit into the United States. The survey, however, was made in the interest of its actual value as a determination of conditions and for its educational value on Spain, should the situation be such as to clearly indicate the danger of her fruit to the United States. Mr. Kisliuk found general infestation throughout the Spanish grape district, which was particularly in mind, including regions which the growers and the Spanish Department of Agriculture had made considerable effort to clean up. He also found other fruit, not only in this district but elsewhere, more or less infested with the fly. Mr. Kisliuk was accompanied by Spanish experts and others who worked with him and witnessed the finding of infestations, with the result that the situation has been accepted by Spain and a full appreciation has resulted of the very patent fact that these restrictions are based purely on pest reasons and have no commercial significance.

Later in the summer, the department was urged by the Spanish authorities to have Mr. Kisliuk visit the Canary Islands to determine whether the rather important tomato crop produced on these Islands

was at all infested with fruit fly, in the interest of possible shipment of more or less of this crop to the United States. Mr. Kisliuk was given authority for such inspection and did a very thorough piece of work on these Islands. In some fields he literally cut up the whole crop of tomatoes, but in no case did he find any infestation by fruit flies, even, as in one instance, where the fruit flies were swarming in citrus orchards bordering the tomato field. Permits are, therefore, now being issued for the entry of tomatoes from these Islands but, as with all other fruit and vegetable importations, subject to inspection at the port of entry.

Another problem which has involved some difficulties is that of the importation of chestnuts from Italy. In Europe, these nuts are subject to attack by the chestnut weevil and the chestnut codling moth, the latter attacking also walnuts and other nuts. Conferences had been held with Spanish importers and commercial representatives of Spain in the United States, with the idea of having steps taken in Italy to remedy the situation, or at least to disinfect the nuts so that the worms in any of the infested nuts would be killed. It is too long a story to give the details, but the outcome was that Italy agreed to treat the nuts under methods that had been suggested by us so as to accomplish this result. Nevertheless, a number of shipments when they arrived at New York showed heavy infestation with living larvae, and further entry of these nuts was refused unless and until arrangements could be made to have them given hot water treatment at New York under the supervision of officers of the Board. After a very short time, the necessary arrangements for such treatment were made by the importers and such treatments have been given these and all subsequent shipments. Incidentally, it may be noted that these treatments were completely effective in destroying the worms, and it is believed that hereafter they will be given in Italy to avoid the very considerable increased cost and difficulty of treatment at New York.

In closing, I should like to correct an impression which some of you have indicated at various times, viz., that the Board may be affected in its judgment relative to quarantine matters by pressure from other Departments of the Government, based on effect of proposed quarantine restrictions on treaty considerations or as to possible reactions on our own exports. I can assure you that the Board has never experienced any such pressure, and that the attitude of the State Department particularly has been one of active support. The State Department has throughout made every effort to see that the necessity for the quarantine or restriction on account of some dangerous pest is made clear to our own representatives abroad—diplomatic and consular—and also to the diplomatic

and other officers of the countries concerned. The necessity for the action taken has been fully understood and appreciated by that department. There has never been any effort to get the Department of Agriculture to change its judgment about such quarantines or restrictions, but merely, as indicated, to aid in seeing that they are understood, and this action has been most helpful.

CHAIRMAN MONTGOMERY: Are there any questions to be addressed to Dr. Marlatt?

WILMON NEWELL: I am sure we appreciate to the utmost this very interesting and frank account of the very wonderful work accomplished by the Federal Horticultural Board the past year.

CHAIRMAN MONTGOMERY: While not on the program, I feel sure you would be glad to hear some report from our neighbor of the North, Mr. McLaine.

L. S. MCLAINE: This is an unexpected pleasure, and I am sorry I am not at all prepared. However, I take great pleasure in attending these conferences on horticultural inspection. We gain a lot of knowledge from these meetings, and we endeavor to put some of it into practice.

I have also attended a number of meetings of the Western Plant Quarantine Board as a guest, and I noticed in the last few years, as was mentioned in the address by the Chairman today, and also in the reports by the various district plant forces, the advisability of closer inspection of nursery stock, particularly in regard to the inspection at time of packing.

For a number of years in Canada we have been advocating that very point, and I am very sorry to say we have had a great deal of difficulty of late with regard to many of the shipments that we have been receiving from the United States. The majority of them are accompanied by so-called blanket certificates, some of which are valid for a year and, in some cases, for a period of 18 months. You can readily understand what this type of certificate means. On the other hand, in all fairness to certain states, I do wish to say they have been making a very strenuous effort to furnish a valid certificate for shipments destined to Canadian territory. In fact the situation has become so acute we are calling a public hearing, to be held the latter part of January, to reconsider our present regulations with regard to shipments from the United States at the present time.

We have regarded the United States more or less as a favored nation, in view of the fact that we have not been requiring the reinspection of shipments from this country. We do require reinspection from all other

countries. It has been necessary for us to reconsider the policy which has been in vogue since 1923. What the outcome of the hearing will be, it is impossible to say, but I imagine we will require the terminal inspection of all shipments coming to us from the United States, and a proper certificate to accompany such shipments. I feel that this will work out to the mutual benefit of all. It will strengthen your hands, particularly state officials, and it will also insure that our people will get healthy material.

I am afraid the message I have brought is not a very happy one, but I feel that it will work out to the mutual benefit of all. I wish to thank you, Mr. Chairman, for this opportunity of saying a word.

CHAIRMAN MONTGOMERY: We will stand adjourned until one-thirty o'clock.

The meeting adjourned at twelve o'clock.

Tuesday Afternoon, December 27, 1927

The meeting convened at one-thirty o'clock, Chairman Montgomery presiding.

CHAIRMAN MONTGOMERY: We will resume the program for the afternoon. The Chair is going to ask that your immediate Past President occupy the Chair.

Mr. L. A. Strong took the Chair.

CHAIRMAN STRONG: The next subject is "The Present Status of the Pink Bollworm and the Thurberia Weevil." I understand it was not possible for Mr. Becker to be present. Mr. McDonald has the paper prepared by Mr. Becker. Mr. McDonald read the paper.

THE PRESENT STATUS OF THE PINK BOLLWORM AND THE THURBERIA WEEVIL

By GEO. G. BECKER, *San Antonio, Texas*

The discovery of the pink bollworm in western New Mexico and eastern Arizona and the discovery of the Thurberia weevil in Cochise County, Arizona, mark the most outstanding recent developments in the status of these two cotton pests. The factors which were responsible for the extension of the range of the pink bollworm to the recently infested territory are likely the same which would operate to make possible the spread of either the pink bollworm or the Thurberia weevil to nearby cotton plantings.

(Withdrawn from publication)

CHAIRMAN STRONG: One of the important problems which the Federal Horticultural Board has undertaken is the control of narcissus inspection problems in conformity with the quarantine placed on foreign bulbs.

Mr. Fracker has made a study of the inspection problems being met with in the enforcement of this quarantine. He has not been out to California to investigate our problems. If he will come out there we will show him some problems in connection with narcissus inspection.

NARCISSUS INSPECTION PROBLEMS

By S. B. FRACKER, *Washington, D. C.*

ABSTRACT

Over 95,000 narcissus bulbs are being grown in the United States at the present time. They must all be inspected twice and certified before shipment is permitted. All but sixteen States grow some narcissus and in many of them one or more bulb-fly or eelworm infestations have been found. Recommended changes in the present procedure relate to financial and technical assistance to the States, investigations, and minor changes in the quarantine regulations.

Several developments of recent years have tended to bring the Federal Horticultural Board and the State inspection services in tocloser contact with each other, and to result in greater uniformity in inspection and certification procedure throughout the country.

One of the more important of these is the attempted eradication of such bulb pests and bulb flies as have recently become established in the United States. It will be recalled that when the commercial importation of narcissus was discontinued on January 1, 1926, this action was ardently supported by the bulb-growing States. As a corollary to the restrictions on importations, the eradication of such infestations of nematodes and bulb flies as exist in this country was undertaken by the States and in order to prevent reinfestation, federal certification is now required for the interstate movement of all narcissus, the inspection being made by State nursery inspection officers as collaborators of the federal department.

The first problem of a quarantine organization is to determine the most desirable procedure from the biological standpoint, and the second one is to adapt that procedure to the already established channels of production and distribution of the industry affected.

The methods of bulb production and distribution in this country involve many different occupations. Up to about two years ago, the original source of supply of bulbs in the United States was the importer, who secured them from planters in Europe. Such importations are still being made with respect to new varieties and propagating stock, but the importer at present is a much less essential link in the chain than heretofore. Such bulbs as are now coming from Europe are planted for propagation purposes and retained on the same premises for a period of two years before being forced, or released for garden planting.

The present source of commercial supply, therefore, consists of the planters who grow the bulbs outdoors and propagate them for increase. This wholesale bulb industry has recently been expanding and there are now on our list 440 producers of daffodils and jonquils and 96 producers of paper whites and other polyanthus types who grow the bulbs outdoors, most of them offering the bulbs for sale for forcing purposes.

The available supply is in excess of 45,000,000 bulbs of the daffodil type and 50,000,000 of the polyanthus, or a total of over 95,000,000 bulbs being grown in the United States at the present time.

There are thirteen States in which the number of outdoor-grown narcissus bulbs exceed a total of 1,000,000 namely, Florida, Texas, New York, Washington, Oregon, South Carolina, Michigan, Virginia, New Jersey, North Carolina, Illinois, California, and Ohio, in the order named.

These outdoor-grown bulbs are sold to four classes of customers: (1) to florists for forcing in greenhouses during the winter months; (2) to home owners who grow the paper whites as house plants and the daffodils outdoors in the home gardens; (3) to retail grocers, hardware and five-and-ten-cent stores, who resell them over the counter to home owners; (4) to dealers who in turn resell the bulbs to any of the first three classes of customers named. The proportion of interstate shipments made by dealers is proving to be much greater than had been anticipated.

It is clear from this outline that there are two classes of ultimate consumers, viz., professional florists and home owners. When it comes to ultimate consumption, however, bulbs differ from many other kinds of products in the fact that they do not pass out of existence when their principal purpose is served. Home owners usually discard the bulbs which have been forced in the house and seldom resell the daffodils, although they may replant them on their own premises. On the other hand, since the commercial value of narcissus bulbs is increasing, there is a growing tendency on the part of florists to sell bulbs which have been forced. These are turned over to the wholesalers who grow them outdoors for the three or four years necessary for the purpose of rejuvenation. In at least one case also, forced daffodils are being sold to consumers for outdoor planting.

Narcissus inspections are made at least twice a year, as this is considered the minimum number of examinations which will give a reasonable idea of pest conditions. The first or blossom-season inspection is devoted primarily to the detection of eelworm infestation, which cannot be satisfactorily determined after the bulbs are dug. Several States are making a number of successive blossoming inspections owing partly to the fact that both early and late varieties are present in the fields.

The first inspections of the year are made in Florida early in January, the paper whites beginning to blossom there during the holidays. Field inspections of these polyanthus types in the south are completed in February and storage inspections begin the latter part of May. Where greenhouse inspections of paper whites are necessary in the northern States, the work occupies practically the same period.

Daffodils are few in number in the Gulf Coast region, but what there are, bloom shortly after the paper whites and are examined at that time. As the season progresses, inspections are made farther north but they should be completed in the Canadian border States before the middle of June.

Storage inspections can be undertaken as soon as the bulbs are lifted, and are in progress throughout the United States, on all varieties, during June, July and August.

The State inspectors are having little difficulty with diagnosis of the bulb flies, as *Merodon equestris* infestation is almost unmistakable when the suspected bulb is cut open. *Eumerus* larvae can be discovered more readily than *Merodon* in stored bulbs, because they are usually near the exterior and the bulbs show evidence of decay. In the field, gaps in the row are indications of fly infestation and should always be investigated. In only a few cases are fly-infested bulbs received at Washington for confirmation although such material is always welcome.

The greater bulb fly, *Merodon equestris*, appears to have been discovered this year only on the Pacific Coast and in Illinois, Rhode Island and Utah, but is known to have been present in the past at least on Long Island in New York State.

The lesser bulb fly, *Eumerus strigatus*, is being picked up in larger numbers and has been reported from California, Illinois, Kansas, Michigan, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, Virginia and Washington.

Eelworm infestations are more difficult to discover, dwarfing in the row and nodules in the leaves being the most pronounced symptoms. Inspected material, especially when found in the stored bulbs, should receive microscopic determination. The identification of eelworms is largely being made at Washington by Doctor N. A. Cobb and his staff. Some of the suspected material sent in by the States has been found to contain saprophytic but no parasitic nematodes, while other material shows not only *Tylenchus dipsaci*, but also other apparently parasitic species, including *Aphelenchus apiculatus* and an unidentified *Rhabditis* or *Cephalobus* larva.

Eelworm infestation has been reported in ten States: California, Michigan, Mississippi, Ohio, Oregon, Rhode Island, South Carolina, Texas, Utah, Wisconsin.

The States which report no narcissus bulbs, or have not reported and are believed to grow none for sale as bulbs, are: Arizona, Colorado, Delaware, District of Columbia, Idaho, Maine, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Oklahoma, South Dakota, Vermont, West Virginia and Wyoming.

The States in which one or more inspections were made but no infestations of any of the three pests discovered are Alabama, Arkansas, Connecticut, Florida, Kentucky, Louisiana, Maryland, Massachusetts, Minnesota, and North Carolina.

Information is incomplete on this subject from Georgia, Indiana, Iowa and Tennessee.

The number of white certificates showing freedom from infestation for 1927, reported to date by the State inspectors amounts to 85 covering 41,385,200 paper white and other polyanthus type bulbs, and 222 covering 27,858,301 daffodils and jonquils.

The number of red certificates showing treatment on account of infestation in 1927, reported to date is 6 covering 9,156,695 polyanthus type bulbs, and 150 covering 14,141, 620 daffodils and jonquils.

With respect to the methods of certification there have been some difficulties which can be adjusted next season. The regulation with which there has been the most difficulty to get the growers to comply, is that which requires them to supply an affirmation regarding the prior certification of the planting stock. Only 125 growers supplied such an affirmation this past year, the remainder of those issued white certificates either having been supplied with these certificates by the State inspectors without the required affirmation or having planted the bulbs dug in 1927 prior to the year 1926, in which case no affirmation was required.

An application form has been prepared and will be sent out shortly in which the affirmation is part of the application itself. This will, it is believed, simplify the procedure and make it easier for the inspectors to determine the source of the stock before the first inspection is made.

A second problem which has arisen as inspection progressed is that of one or two State inspectors who have misunderstood the provisions regarding roguing and have issued certificates after having eliminated the visibly-infested bulbs in the warehouse. In several cases the certificates had been issued and the bulbs of the lot from which the visibly-infested ones had been removed were being shipped under white certificates and without treatment before the circumstances were discovered

at Washington, and therefore could not be remedied. It is believed that less difficulty from this source will arise next season as State entomologists and nursery inspectors of the various States are becoming more familiar with the narcissus work.

The object of requiring treatment of the bulbs in the event that even a slight infestation with either bulb flies or eelworms is found at the time of warehouse inspection is the difficulty of sorting infested from uninfested bulbs in storage. The details of this situation are given in HB-195, a mimeographed circular issued by the Federal Horticultural Board in 1926, where it is shown that not all the infested bulbs can be discovered by an examination of the exterior. The results which this circular describes were largely inspections for eelworms and greater bulb flies.

Having in mind the purpose of narcissus inspection, namely, the total eradication of some or if possible all species of parasitic bulb nematodes and bulb flies in the United States, and in consideration of the reports which have come to the Federal Horticultural Board and the limited number of observations, the writer has been able to make in the field this past season, it appears that the needs of the narcissus inspection work may be outlined somewhat as follows:

(1) Financial assistance for a number of States with large plantings of narcissus bulbs and with a nursery inspection staff inadequate to give them proper attention. It will be very difficult and perhaps impossible for the federal department to supply such financial assistance during the season of 1928, but it is hoped that by the summer of 1929 something can be done along this line.

(2) More technical assistance to the inspectors in the way of diagnosis of the pests concerned. This should include the employment of one or more specialists who would work with the inspectors in the different States, and it therefore involves a financial problem related to the need just described.

(3) Investigations of at least two especially pressing problems: (a) further facts relating to the taxonomy, host relationship, and economic importance of the lesser bulb fly, and (b) improved treatments, to avoid the objections to both the hot water treatment and the carbon disulphide treatment where the bulbs are to be grown in greenhouses immediately afterward.

(4) Minor changes in the regulations (a) requiring some form of certification on all bulbs moved interstate in order that inspectors at destination may have evidence that the bulbs are free from infestation or were treated; (b) clarification and simplification of the requirements for the

interstate movement of bulbs just after forcing by florists; (c) authorization for the interstate movement of bulbs across State lines to treating plants. It appears dangerous to permit the transcontinental shipment of large quantities of fly-infested bulbs for treatment at destination but there are a number of States within which no treating plant exists where the number of bulbs does not justify the purchase by any individual grower, and in such cases the movement of bulbs to a plant in a neighboring State for treatment appears desirable.

The Federal Horticultural Board is giving consideration to a revision of the regulations at the present time and any suggestions along these or other lines on the part of State inspectors who have had to meet narcissus inspection problems will be appreciated.

CHAIRMAN STRONG: Is there any discussion of this subject?

L. S. MCLAINE: Has it been definitely established that the lesser bulb fly is a primary or secondary pest?

S. B. FRACKER: I should like to ask Dr. Baker to discuss that problem, if he cares to do so.

A. C. BAKER: As yet we have not arrived at an opinion on that point. There appear to be several species which have been confused in the past records. It will be necessary now to determine the response of each one of those species.

S. B. FRACKER: If my understanding is correct, at least one species is injurious to the healthy bulbs.

P. A. GLENN: We found the bulb fly attacking the healthy bulbs.

CHAIRMAN STRONG: We have found some surprises out West in the lesser bulb flies. Dr. Cole and Dr. Doucette have been working on the bulb fly. I think they are going to be ready, before a great while, to give us some valuable information, with respect to the biology and treatment. I think they are discovering some rather remarkable differences in the time of treatment, which is going to be of great value in doing our work throughout the western states, at least.

H. F. DIETZ: In Indiana we find we are getting bulb mites on a lot of things. We had one case where practically 10,000 bulbs of one variety of gladiolus were attacked by the bulb mite. The bulbs were stored in a place where narcissus were previously stored. In such storage inspection as I made this year I found the bulb mites constantly present. That does not only apply to Indiana. It applies to several other States who have passed the rule to examine bulbs.

Miss Bessie M. Broadbent: With respect to the bulb mite, in the experience I have had so far in connection with that problem, I do think there is a difference in the susceptibility of different bulbs to the attack of bulb mite. They might not be primary in connection with the common bulbs, and yet cause what appears to be severe and, perhaps, primary injury on lilies and certain other things, where the bulb mite alone seems to be the cause. I believe there are some observations in California in connection with callas where the bulb mite is held responsible for the injury.

Chairman Strong: Is there anything further on this bulb question? The next paper is by Mr. Detwiler of the Bureau of Plant Industry.

DEVELOPMENTS IN WHITE PINE BLISTER RUST CONTROL IN THE UNITED STATES

By S. B. Detwiler, *Senior Pathologist in Charge, Office of Blister Rust Control, Bureau of Plant Industry, U. S. Department of Agriculture*

A big wave of infection, such as took place in 1927, causes the most significant changes in the blister rust situation. Some spread and intensification takes place each year but periodically there are years which are especially favorable for development of the rust. These exceptionally heavy infection waves tend to occur at intervals of 3 to 5 years. This appears to be due partly to the fact that an infected pine tree does not produce the blister rust spores that repeat the rust cycle until 3 years or more after infection takes place on it. However, after the rust is established, the chief cause of these infection waves is the occurrence of favorable infection seasons. Cool, moist summers make favorable conditions for the spread of the rust.

The disease is caused by a fungus which was introduced into the United States from Europe. Unlike some important plant pests, no parasitic enemies of this fungus have been discovered which can be introduced here to help effect control of the disease. Its control is *entirely dependent upon human action*, direct or indirect, in bringing about the local segregation of its alternate host plants (Ribes and five-leafed pines). Once a forest area is cleared of Ribes, it tends to remain free of these plants if a dense forest cover is maintained.

Control measures are applied in most cases to protect commercial white pine forests by destruction of Ribes (currants and gooseberries). Regulatory measures to assist in securing control of the rust are of fundamental importance; first to retard spread of the disease, and second,

to secure the destruction of currant and gooseberry plants in control areas. This paper summarizes the blister rust control situation from its regulatory aspect.

Status of Infection by Regions

New England. The rust was introduced from 1897 to 1910 and intensified from 1910 to 1916. Accumulative damage to pines has been severe on unprotected or lately protected areas in the northern half of the white pine region. In the southern half of this region damage is light, as yet, due to sparse distribution of wild Ribes.

New York. Introduction took place 1900 to 1909, and intensification from 1909 to 1919. Damage is heavy in the pine region of the Adirondacks, and light damage has occurred in several additional counties in the northern half of the state. In the southern and western half of the state the rust is still in the very early stages of intensification.

New Jersey and Pennsylvania. Introduction took place from 1905 to 1909 on imported stock, and on local nursery stock in New Jersey up to 1916, but intensification was largely prevented by sanitation-cutting of pines. Since 1916 there has been some intensification of the rust in several counties in northern Pennsylvania. A survey in 1927, conducted through the public schools, shows that the rust has spread on Ribes throughout Pennsylvania and is established on native pines on the Cook forest in Clarion County. New Jersey, in 1927, had more infected Ribes distributed over seven counties than were found in any previous year, but no centers of infected pines have been found.

Southern and Central States. The blister rust apparently has not spread into Delaware, Maryland, Virginia, West Virginia, the Carolinas, Georgia, Kentucky, Tennessee, or in the Ohio Valley and central states. It is probable that the rust spread south of Pennsylvania in 1927, since rust was found in counties adjacent to Maryland and West Virginia. Scouting was very limited in these states in 1927 because of lack of funds for this purpose. Shipments of infected pines were traced and destroyed in Virginia in 1911, Ohio in 1910–11 and 1916–17, Indiana in 1910, Iowa in 1917, and South Dakota in 1917. No spread from these centers has ever been found.

Lake States. Introduction of the rust occurred in 1908–09, but at very few points. The disease was found on Ribes in 17 counties in Michigan in 1927, whereas it had previously been found only in two counties. The rust has now reached south to the Indiana line and north of Grand Rapids. In Wisconsin and Minnesota little scouting was done in 1927, but scouting in previous years shows that the rust is approach-

ing the light damage stage in the southern half of the pine region in these states. Control work since 1917, done where centers of infected pines were found, has met with marked success in decreasing the rate of spread and establishment of the disease in the Lake States. This success is apparently due in part to the limited distribution of white pines in the infected territory, so that pine infection centers could be readily found and eradicated.

PACIFIC COAST STATES. The blister rust was introduced at Vancouver, B. C. in 1910, spread rapidly to distant points, and has reached the heavy damage stage in the coast region of British Columbia. It is intensifying heavily on pines in the Olympic Peninsula of Washington, and is rapidly becoming established in northeastern and southwestern Washington. In northwestern Oregon, Ribes were infected in two additional counties in 1927, making a total of five counties infected since 1925. The rust has not yet been found in southern and eastern Oregon, nor in California.

IDAHO AND MONTANA. The rust was found for the first time in Idaho, in 1927, and also in the southeastern portion of British Columbia near the Montana line. These infections were found on Ribes, but the disease is in the intensification stage on pines over a large area in eastern British Columbia extending from Revelstoke to a point 30 miles north of Idaho. Blister rust infection appears to have first occurred in eastern British Columbia on *Ribes nigrum* L. (European or cultivated black currant) in 1917, through natural spread from the coast region. In 1927 the rust was very prevalent on cultivated and wild Ribes in the eastern part of the Province.

The long-distance spread of the rust from infected pines to *Ribes nigrum* was further proved in 1927 by finding the rust on cultivated black currants north of Prince George, 350 miles north of the established range of five-leafed pines.

ROCKY MOUNTAIN STATES. White pine blister rust has not been found in these states south of northern Idaho. The five-leafed pines of this region are considered of secondary importance for timber production, though high in scenic value. Some foresters consider that limber pine has commercial possibilities in limited areas, and it has value for watershed protection. In view of these facts it would be well for the Rocky Mountain States to start educational campaigns to secure elimination of *Ribes nigrum*.

STATUS OF GENERAL CONTROL WORK

Blister rust control work is conducted in close cooperation with the regulatory authorities of the pine-growing states. The work is mainly of

service and educational character, but it is of primary importance that adequate regulatory authority exist for use when necessary. As infection increases in a state and a variety of control problems arise, it becomes expedient to enact specific blister rust control laws.

Maine, New Hampshire, Vermont, Connecticut and New York have special blister rust control legislation giving ample regulatory authority to the state forestry departments. Massachusetts, Rhode Island, Michigan, Illinois, Washington, Oregon and California have special legislation dealing with plant pest control under which the state agricultural departments can establish and enforce blister rust control measures. The other states operate under their general horticultural and nursery inspection laws. Blister rust control areas have been legally established in Maine, New Hampshire, Massachusetts, Rhode Island, New York and Idaho, thus enabling interstate shipments of blister rust host plants to be excluded from these areas in accordance with the provisions of Federal Plant Quarantine No. 63.

The general aim of blister rust control is systematic local segregation of five-leafed pines and Ribes on areas best suited to their respective production. *Ribes nigrum*, however, is being generally eradicated because of its high susceptibility to infection, great pine infecting power and small economic importance. The opposition of the United States Department of Agriculture to the growing and planting of *Ribes nigrum* in the United States is generally understood, and authorities in the pine-growing states are giving good cooperation in the elimination of this plant. This is being accomplished by the restrictions of Federal Quarantine No. 63 on the interstate shipment of this plant, and by educational measures, supported by state regulatory action when other means have failed to get results. Over 90 per cent of black-currant owners remove their plants willingly when asked to do so. Massachusetts, New York, Montana, Idaho, Washington, Oregon and California have declared *Ribes nigrum* a nuisance plant; its eradication from Montana, Idaho, and Oregon has been completed and is in progress in the other four states. Michigan has quarantined 18 infected counties against possession and planting of *Ribes nigrum*.

Nurserymen desiring to grow white pine stock can and should produce such stock free from blister rust. To do this, the stock must be grown from seed in an area from which all *Ribes nigrum* bushes are absent within a radius of at least one mile, and no Ribes plants of any species present within 1500 feet of the seed beds and transplanted stock. Constructive quarantine policy requires that greater attention be given to this matter by state inspectors and nurserymen so that sanitation of

nurseries against white pine blister rust becomes a standard practice throughout the United States. If Ribes are present, nursery inspection cannot insure freedom of the pines from the rust because the disease cannot be detected on white pines until several years after infection has occurred, but inspection can insure absence of Ribes in the protective zone, and thus insure healthy pines. The protective zone around nurseries should be wider than around a woodlot, since loss of a few trees does not occasion commercial damage to a woodlot but would do great harm in nursery stock distributed in uninfected or lightly infected territory. Our common purpose in this matter is to assure healthy stock to the purchaser of white pine, with minimum restriction on the movement of such stock. This also applies to less susceptible Ribes, and is accomplished by fall inspection of the plants, and by shipping them only when dormant, defoliated and dipped in a fungicide of specified strength. Sanitation measures of this character are enforced with respect to Ribes which are permitted shipment out of the infected states under the provisions of Federal Quarantine No. 63.

Status of Local Control Work

Local control of the blister rust is being successfully accomplished under an eight year cooperative program in New England and New York, and under a 10 year cooperative program in the Inland Empire and Pacific Coast states. In the northeastern states, since 1922, about 5,000,000 acres have been cleared of wild and cultivated Ribes, at a cost averaging 18 cents per acre. Including the experimental control work done prior to 1922, about 6,000,000 acres, or two-thirds of the estimated acreage of the northeastern pine area, have been brought under control. The land owners pay the cost of Ribes eradication, but receive supervisory aid from the state. The United States Department of Agriculture leads the service and educational work required to get pine owners interested and proficient in control. The land must be re-examined for Ribes on an average of once in seven years. However, the cost of re-eradication work is less than the initial cost because Ribes are fewer and smaller. After the initial work is done, well stocked pine stands over 25 years of age commonly remain practically free from Ribes until maturity. The average annual cost of Ribes eradication for blister rust protection in the northeastern states is less than five cents per acre per year, and this is no serious handicap to the profitable growing of white pine under forest management.

The control program in the West is divided into a five year experimental phase, ending in 1930, followed by a five year period of large

scale application of control. Progress in development of feasible methods of local control has been more rapid than was anticipated in the schedule of accomplishment outlined in the control program.

Pole stands and mature timber constitute about two-thirds of the acreage cleared of Ribes and the costs of Ribes eradication in such stands have averaged 85 cents per acre. Young timber growth covers about one-fourth of the area and costs of control in this type have averaged $3.17 per acre. The open, brushy, stream type comprises one-twelfth of the total acreage and the average cost of freeing it from Ribes has been $11.46 per acre. Cost of control will vary according to the proportion of these types in the control area. Present results indicate that large tracts can be protected at costs averaging from 10 cents to 25 cents per acre per year.

Control reconnaissance on more than 600,000 acres in the western white pine region shows that 60% of the white pine land is free from Ribes, while 40% bears Ribes and requires systematic crew work to remove them. The more open stands will have to be re-examined at five year intervals. Well-stocked stands apparently remain free from Ribes after the initial eradication work is done until the stand is opened up by logging or fire. It has been found that Ribes seeds remain in the soil for long periods, in viable condition, and there is often a heavy regrowth of Ribes after the ground is exposed by light burning or disturbed by logging.

Data on Ribes ecology indicate clearly that permanent and effective suppression of Ribes can be secured to a very large degree through practicable methods of forest management. Another highly important development in the western control experiments is that *Ribes petiolare* Dougl., a susceptible species growing abundantly in the stream type, is readily and completely killed by spraying the foliage with a solution of sodium chlorate. A light weight forest-fire pump has been modified to give spray pressures of 250 to 300 lbs., and by this means a chemical crew can eradicate Ribes in the stream type at about one-third the cost of pulling the bushes by hand. Further research is being done to make the spray solution fully effective against other species of Ribes, to decrease the cost of spray application and to improve the efficiency of the spraying machinery. These and many other developments give a sound basis for believing that blister rust control in the West will prove to be as practicable and as readily accomplished as it has been found to be in the East.

CHAIRMAN STRONG: Dr. Marlatt explained this morning about the finding of the Mexican fruit worm in Southern Texas last year. Dr. Baker has had charge of the eradication work for the Bureau of Entomology.

PROGRESS OF THE MEXICAN FRUIT WORM ERADICATION

By A. C. BAKER, *Washington, D. C.*

(Withdrawn for publication elsewhere)

CHAIRMAN MONTGOMERY: Dr. Baker's presentation certainly can be regarded as a progress report.

The next paper is on "Pacific Port Inspection." You will recall that at last year's meeting Mr. L. R. Warner presented a paper giving consideration to the inspection methods as followed at Florida ports. We are fortunate in having with us this year Mr. Lee A. Strong, who will give a companion paper, if I may so call it, upon inspection methods as followed at Pacific ports.

PACIFIC PORT INSPECTION

By L. A. STRONG, *Sacramento, Calif.*

(Withdrawn for publication elsewhere)

CHAIRMAN MONTGOMERY: You will all agree with me that that was a splendid presentation.

L. S. MCLAINE: I should like to ask the speaker if the officers of the Federal Horticultural Board are permitted to open passengers' baggage coming from Hawaii.

LEE A. STRONG: The Federal Plant Quarantine Act authorizes the Secretary of Agriculture to make such rules and regulations as may be necessary. He specifically states in the quarantine that the Federal Horticultural Board inspectors have the right to inspect baggage and make such disposition as may be necessary, if it is coming from a foreign port. Unless it is something very recent, the Federal Horticultural Inspectors have no authority to search. The customs officers make the inspection and call it to the attention of the plant inspector, and if it is something that should be inspected the plant quarantine man has the right to search and make arrest.

CHAIRMAN MONTGOMERY: I think Mr. Strong's statement is correct. I know that is our understanding. We are not in possession of direct authority, but fortunately, in Florida, as in California, have that authority extended to us through the customs.

The next paper will be by Mr. Haseman of Columbia, Missouri.

SHALL THE STATION ENTOMOLOGIST ALSO DIRECT THE REGULATORY WORK?

By L. HASEMAN, *Columbia, Mo.*

In those States where the regulatory work of plant inspection and quarantine is still directed by the station entomologist there arises the question whether or not the entomologist should be relieved of the police duties. In most States where both activities were formerly under the same direction, Entomological Commissions, Plant Boards and Boards of Agriculture have taken over the regulatory work, though everywhere in some cases the station entomologist still serves as state entomologist under the commission or board. In such cases, the Agricultural Experiment Station is no longer responsible for the regulatory work though the entomologist continues to serve in the double capacity. In still other cases the two lines of work are separate and distinct and each is directed by a separate official.

The writer has had some 18 years experience with the regulatory work as a regular part of his duties as station entomologist and three years in the double capacity as station entomologist and state entomologist under the State Plant Board. It will be his purpose, therefore, to simply give his views and open the subject to such discussion as others may wish to offer.

Agricultural Colleges and Agricultural Experiment Stations were created for educational and investigational purposes and the enforcement of plant inspection and quarantine regulations is no part of their regular functions. Boards and commissions may be created for this purpose and from an administrative point of view they are the logical bodies to administer plant acts. Strictly speaking, they involve police duties and are, therefore, not a part of College and Station activities. Most Colleges and Stations feel relieved of a burden when the work is transferred to a board or commission.

In practically all States the work is now either completely separated from the College and Station or the entomologist directs it as an activity separate from his other work. Where it is separated it is usually more

liberally financed and manned. There seems to be no longer any question about the desirability of divorcing plant inspection from regular college and station work.

On the other hand there is still a difference of opinion among entomologists as to whether or not the station entomologist should continue to direct the regulatory work. There are both advantages and disadvantages in the combined activity. These vary with conditions as found in different states. As far as economy and efficiency to the inspection service are concerned the work should continue under the entomologist's direction. He can train and select his inspectors and bring to bear directly on the inspection problems the results of his investigations and the field activities of his extension staff. He can also at any time use demonstrations or educational methods in place of police force where he finds that is the proper solution of any problem. Regulation without adequate use of educational work usually fails of permanent results. The entomologist in charge of teaching extension and investigation, therefore, has the broader view and more at his disposal which he can bring to bear on any regulatory problem. Without doubt, where the work is adequately financed and manned with trained inspectors so that the entomologist can simply serve as general director, the regulatory work will benefit by his continuing in charge. In such a combination it is the regulatory work which profits most.

Where the entomologist is unable to get adequate help so that he is relieved of all general routine it may require so much of his time that his College and Station work is likely to suffer. Under such conditions he should be relieved of the inspection work. The ideal condition is where he is free to devote his attention primarily to his college and station work and simply serve in an advisory capacity in directing the plant inspection activities. In this way he can unify the entomological work of the state, maintain a general supervision over the different activities and make sure that the regulatory work is effective in preventing further introduction and spread of scourges. In such a case while the two departments may in reality be separate and distinct, still their efforts may be closely coordinated and both strengthened. It is the writer's opinion that in most states the best results may be expected where the regulatory work is administered by a separate Board or Commission and where the entomologist of the Agricultural Experiment Station or the head of the department in the College acts primarily in an advisory capacity.

CHAIRMAN MONTGOMERY: The next paper is by G. G. Becker, San Antonio, Texas. This will be presented by Paul H. Miller.

NON-PEAR ZONES AND BLIGHT ERADICATION

By GEO. G. BECKER, *Former Chief Inspector of the Arkansas State Plant Board*

On the assumption that in the Arkansas Ozarks pear blight as a disease of apple orchards is capable of maintaining itself only through the agency of pear trees an attempt is being made to eradicate the disease by requiring the destruction of pear trees. The results indicate that the disease is being eradicated by this means.

In the apple growing regions of the Arkansas Ozarks commercial pear culture, because of the frost and blight hazard, is not generally considered to be profitable. Such pear trees as occur here are usually in home orchards or else in neglected plantings. It is not surprising, then, that, following the success in the eradication of cedar rust in this region, apple growers demanded the eradication of pear blight by requiring the destruction of pear trees.

Various plant pathologists, especially Dr. J. H. Roberts and Mr. Leslie Pierce of the Bureau of Plant Industry, were consulted on the feasibility of such a program, and the late Dr. J. A. Elliott, as plant pathologist of the Arkansas Experiment Station and as a member of the Arkansas State Plant Board, was, of course, particularly active in planning the details of the work. It was known to the Board at that time that pear blight had, on occasions, been found to winter over on apple but this was considered to be exceptional. On this latter point, however, the writer hastens to say that it is not the purpose of this paper to discuss the technical status of the pear blight organism with reference to its various hosts. As an entomologist and plant quarantine officer it is merely the object of the writer to give the results secured in eradicating pear trees from the vicinity of apple orchards.

In 1922 a pear blight survey was made under the direction of the writer by Mr. Geo. W. Winfrey to determine to what extent pear blight in apple orchards could be traced to pear trees. Mr. Winfrey paid particular attention to orchards in which blight injury was especially severe and to those which were singularly free of the disease. Most of the orchards visited were in Benton County, Arkansas and a few were near Neosho, Mo. The survey indicated that pear blight in apple orchards varied with the nearness and with the number of pear trees which were close enough to spread infection to the orchard. In general, Mr. Winfrey found that pear blight in apple orchards was negligible where there were no pear trees closer than a mile.

In view of these facts the Arkansas State Plant Board on Nov. 11, 1922 promulgated a public notice under the provisions of which it became unlawful to maintain, in certain areas, pear or quince trees infected

with pear blight when they were within a mile and a half of an apple orchard. Following the promulgation of the order many pear trees were cut with little delay. In other instances owners tried to keep blight cut out but eventually gave up the task as hopeless. The regulations were first tried out legally in the spring of 1926 when an owner of a small orchard was fined in the circuit court of Benton County for refusing to cut down 85 pear trees which inspectors found to be infected with pear blight. While substantial progress has been made all over the regulated territory there are still quite a few trees standing. In some districts, however, practically all of the pear trees have been cut.

The writer resigned his position with the Arkansas State Plant Board in June 1926 but for some time previous to that it was apparent that, from the standpoint of the orchardist, pear blight in the apple growing region of the Arkansas Ozarks was being eradicated by the destruction of pear trees. It was noticed that there was a definite decrease in the extent of losses being caused by pear blight and that the extent of reduction of these losses was correlated with the extent to which near-by pear trees had been cut. The writer has records on pear blight in 11 orchards in which the disease caused almost annual heavy losses but which have been practically free of blight since near-by pear trees were cut. Many other orchards have, of course, been benefited but dependable records on them are not available.

In the case of a Jonathan orchard near Gravette, Ark., blight caused heavy losses practically every year up until 1922. In 1922 the estimated loss in this orchard was 95% of the blossom clusters because of the ravages of blossom blight. In the fall of 1922 the near-by pear trees were cut down. Though there have been years since that time when blight losses have been severe, blight in this orchard has been either negligible or altogether absent since 1922.

In a large block of Jonathan and Maiden's Blush trees in an orchard near Bentonville the estimated loss caused by blight was 90% of the crop for 1924. At that time pear trees were within 100 yards of this orchard on two sides. Most of the pear trees in the vicinity of the orchard were cut the following winter. Though blight losses were heavy in other parts of Benton County in 1926 the injury in this orchard was negligible. The writer learns through correspondence that blight losses in this orchard were also negligible in 1927.

In a block consisting of four orchards largely planted to Grimes, Jonathan and Maiden's Blush and located near Centerton, Ark., pear blight caused heavy losses practically every year until 1923. Following

the promulgation of the pear blight regulations many trees were cut and by 1924 practically all pear trees within a mile of these orchards had been cut down. In 1924 blight was negligible in these orchards and it has remained so ever since.

Through the persistent efforts of Mr. J. F. Fagan, deputy inspector of the Arkansas State Plant Board, to make the Bentonville area a blight free area more work was done around Bentonville in 1925 and 1926 than in any other area of its size under regulation. As eradication progressed blight losses decreased and the writer learns through correspondence with Mr. Fagan that in 1927 the apple orchards of the Bentonville area were singularly free of blight.

During the years that records show blight to have been negligible in the orchards previously discussed in this paper, blight continued to be severe in other localities. In numbers of instances these badly blighted orchards were only ten miles or less from clean orchards. Inspectors noticed that the extent of blight in these check orchards always varied with the nearness and the number of pear trees from which infection might spread to the orchards.

In conclusion it may be stated that, from the practical considerations of the orchardist, abundant and clear-cut evidence in the field will attest to the fact that pear blight is being eradicated from the apple growing regions of the Arkansas Ozarks by the eradication of pear trees and that the progress of eradication is apparently limited only by the extent to which local prejudices and lax law enforcement interfere with or delay the cutting of pear trees.

CHAIRMAN MONTGOMERY: Those of you who have attended the meetings of the Section will remember that we always have some discussion of the Japanese beetle. Mr. Smith is not here to give his paper on the subject, so I shall call on Mr. Fracker, Mr. Rohwer and others to make some statement as to recent developments.

S. B. FRACKER: The spread during the past season is a matter of public record, the amendment to the quarantine having already reached most of the members of this organization. There was little spread to the north, only a few townships in Connecticut and New York being added to the regulated area. More extensive spread occurred north of Harrisburg in Pennsylvania.

As you know, there were also some isolated outbreaks in Maryland, Delaware and south-central Pennsylvania, which are being attacked on the eradication plan, and which have not yet been included within the

Federal quarantined area. The farthest west the beetle was discovered this past season was Gettysburg, Pennsylvania.

S. A. ROHWER: Among the isolated infestations which are being attacked on an eradication basis was the one in the District of Columbia. It had originally been intended to ask that the appropriation for the fiscal year, 1928–1929 be made available as soon as the agricultural bill passed. In consideration of the infestation in Washington City, however, this plan was changed, and an item of $50,000 was included in the urgent deficiency bill which has already passed Congress and has been signed by the President. Part of this sum will be employed in eradication measures in the District of Columbia.

Another interesting feature of the work this season is the recovery of parasites, and it can be stated that the parasite work is developing in a most promising manner.

CHAIRMAN MONTGOMERY: I should like to call on Mr. Burgess at this time for a discussion of the gipsy moth situation.

A. F. BURGESS: In the eastern infested area there was severe defoliation in 1927. The area most severely attacked covered about 150,000 acres. Outside the main infested area there were local spots of heavy infestation which were larger and showed a heavier infestation than in previous years. The maximum recovery of parasites was in 1923, and the defoliation was low that season. Parasite recovery has fallen off since that time, and the infestation has become more serious. Parasite introduction started in 1907.

In addition to parasites, important factors in the control of gipsy moth infestation include winter temperatures, starvation and fungous diseases.

In the barrier zone along Western Vermont, Massachusetts and Connecticut, there was 115% increase in the number of egg masses found this past season, but there has been no increase in the boundaries of the infested area itself.

The flood situation in New England made Christmas tree inspection extremely difficult, and required us to modify our plans as to the field methods of inspection.

CHAIRMAN MONTGOMERY: We will now have the committee reports. I will call on Mr. Strong for the report of the Nominations Committee.

LEE A. STRONG: Having had chairmen the last three years from the extreme east, the extreme west and extreme south, the Committee recommends that we now go north for the Chairman for next year. We, therefore, recommend the name of L. S. McLaine, Ottawa, Canada, as Chairman, and S. B. Fracker as Secretary.

A motion for adoption of report was regularly made, seconded and carried.

The meeting adjourned at 3:45 o'clock.

THE CONTROL OF THE BEEMOTH

By F. B. PADDOCK, *Ames, Iowa*

ABSTRACT

An outline is given of the factors of control for this pest. Climate and parasites are factors of natural control which are much restricted in service. Traps, sanitation, fumigation, repellents, heat and cold are factors of artificial control. Experiments are being conducted which will give more definite information of some of the possibilities of artificial control.

The ravages of the beemoth or waxworm have been known to mankind since the very earliest records. Since that time this insect has slowly but surely spread to every land where bees are kept. The spread of the moth has been slower than the distribution of the honey bee. This retarded spread has not been due to effective natural barriers or to artificial methods employed by beekeepers. Without exception other economic insect pests have been greatly influenced in their ravages by natural limiting factors or by man-developed practices. It is therefore interesting to take an inventory of the factors of control in operation against the beemoth. These agencies can be grouped in two general classes, natural and artificial.

Climate is the first factor of natural control of the beemoth. Just what balance of these factors serves as the check is not understood at present. There are one set of conditions based on altitude. In Austria the beemoth has been a pest from the earliest times but its ravages become less severe in the mountainous regions. Beekeeping is conducted at elevations safely above the range of the moth. In Sweden the moth is common among beekeepers on the coastal area, but disappears in the mountains. Beekeeping is conducted at elevations above the occurrence of the moth. A similar restriction of the moth is known to exist in the United States in parts of Colorado, Wyoming and Montana. In this section the critical elevation seems to be between 4,000 and 5,000 feet.

At this time it is hard to say if humidity is a correlated factor with altitude but under another set of conditions it may well be regarded as a limiting factor. The beemoth was recorded in England at an early date. The spread has been general but slow and never has the moth been an outstanding source of loss to the industry. In Scotland the moth has been known for a long time, it is generally found over the country but

is not doing severe damage. Climate in its inclusive meaning must serve as the check on this pest.

Parasites may be regarded as the other agency of natural control of the beemoth. The outstanding feature in this case is that a pest of such antiquity and such general distribution should be so little subject to biological factors of control. The recorded parasites come from three families, three species of *Braconidae*, three species of *Chalcididae* and four species of *Ichneumonidae*. The reported parasites, with one exception, are primarily parasites of other economic pests. Only three of the recorded species are known to occur in the United States and their occurrence has been most sporadic. There is certainly no real control of the beemoth by the agency of parasites.

Reviewing the factors of natural control it is evident that as a relief measure it is of no real benefit. For help in the control of the beemoth it is apparent that man-made practices must be depended on for real success. Development along this line has been very slow and indifferent. In fact through almost 2,000 years the beekeeper has been confronted with the ravages of the moth and his efforts have been of only little real service. What has been done is interesting mostly to obtain a retrospect view of the problem.

Traps for the control of the beemoth were discussed by Collumella as follows: "To this end, a vessel with a narrow neck increasing gradually to a wide mouth, with a light in the neck should be placed under the hive in the evening. The moths gathering from all parts around this light are in that narrow space, scorched and killed." This method of control has been advocated occasionally since that time but seems to be worthless in solving the problem.

Sanitation was also recognized by Collumella as a relief measure when he says "Particular care must be taken to sweep out every caterpillar and to destroy all moths." Butler in 1623 enlarges on sanitation to include the beeyard. He said, "The flying moth breedeth little worms. Rid your hives of these guests. They hide in long grass and weeds." An interesting confusion existed at that time for Butler says, "The maids that sun their clothes to rid their flea, let them take heed how they do it near the beefold, lest they bring in worse enemies than they carried out." English writers continued to recommend the measures of sanitation which surely was an aid when immovable frame hives were used. Warder in 1720 says, "Disturb and shake out all maggots, clean away all trash." A little later it was advised to fill all cracks of the hive with lime for it was known that these aided the moth. In 1819 Wildman advises "Lift up the hive in the morning, kill the moths and also clear

away all webs." Later more severe measures were prescribed. Cotton in 1842 says "Turn hive up and cut freely out the whole of such combs as have the grubs in them. Do this in the spring. Prevent the moths by using a small entrance." As late as 1870 Bevan recommends "Frequently lift up the hive in the morning and kill all you can see. Drive bees into a new hive then cut out and destroy infested combs."

This relief measure failed to hold the moth in check and so more effective means were sought. With the coming of the movable frame hive the weak spot seemed to be the control of the moth outside the colony. By this time the practice was well established of maintaining strong colonies, and Italian bees were becoming fairly common and also progressive beekeepers were using the movable frame hive.

Fumigation was then to displace the sanitation and trap program as it has been recommended up to 1880 when Cooke summarized the control of the moth. "Examine infested hives, collect and burn the larvae. Special hives are of no avail but have strong colonies in movable frame hives. Trap moths and larvae by wooden blocks and cloth. Band around the outside of the hive to trap the moths during the day."

Sulfur or brimstone as it was then called, was the first material considered as a fumigant against the moth. It was recommended for use with honey stored in combs and any empty combs not in use in the hives. The dosage was ¾ pound per 200 cubic feet of space. It was recognized that this treatment was not effective against the eggs so it was recommended to refumigate in ten days. In England it was said by Cawan that "sulfur fumes destroy the eggs of the moth as well as the larvae." This may be accounted for in the light of recommendations of Bonney of Iowa in 1918 when he says "Burning sulfur becomes efficient by adding moisture to the air." His dosage was much higher, being 1 pound per 100 cubic feet. Other recommendations take into account the resistance of eggs to sulfur fumes and advise a refumigation. As late as 1922 sulfur fumigation was considered "as cheap and as effective as any method" in Germany. However, frequent treatments were necessary to effect control. The advantages of sulfur may be listed as follows: It is readily available, is cheap and not dangerous in application. The disadvantages are the uncertainty of results and necessary presence of a source of fire.

Carbon bisulfide was offered as an improved material for fumigation against the moth just prior to 1910. This material had been extensively used against other insects in the years just preceding this date. Its use developed very rapidly and dosage tables were developed by the writer in 1911. The recommendation was 1 ounce of bisulfide for every 4 cubic

feet. The advantages of this material are: effective against all stages, reasonable in price, accessible, rapid, no active source of fire. The disadvantage is the outstanding liability of combustion and explosion. In reality its use is considered dangerous in the hands of an ordinary operator. Carbon bisulfide has been recommended in Quebec in 1914 and in France in 1921.

Carbon tetrachloride followed closely on the advent of bisulfide since it overcame part of the recognized serious objections to the use of the latter. Its use was recommended in France in 1912 where its cost was less than bisulfide, slower to evaporate, less smell, no danger to the operator, no danger of fire or explosion and was effective against all stages of the moth. In this country it did not seem to replace bisulfide as it was not readily available and the cost was not satisfactory.

Hydroycanic acid gas was recommended for fumigation against the moth in 1917 by German workers. It was extensively advised in publications where detailed explanation of methods of operation were described. It was offered as an advance over sulfur fumigation. Its use apparently never reached outside of Germany. From our viewpoint the application of this material is recognized as effective but its use is beset only with extreme danger as the gas is so deadly.

Paradichlorobenzene became available next as a fumigant for the moth and was heralded by beekeepers in 1919. This soon became known among beekeepers as "Para" and later as "moth fumigator." Its early use was most extensive throughout the southern sections of the United States. It has been made generally available to beekeepers at a moderate cost but its use has not been as extensive throughout northern sections as was expected. It soon became evident that it was not thoroughly effective under all conditions and in fact no accurate dosage table has been devised for moth fumigation. The writer has now experiments under way to determine the dosage and optimum conditions of temperature and humidity. There is now available a standardized product which will undoubtedly render general use more probable. The gas is five times heavier than air so that it is difficult to confine the gas in high piles of supers containing combs. The gas is very effective when confined and its use is not accompanied with the usual dangers of fire and overcoming the operator. This material should prove popular when its use is properly advised after experimental data is available.

Gobal, a proprietary compound was offered to beekeepers in Germany in 1919 as a material to kill the moth. Its use apparently was not extensive nor of long duration. Zyklon was recommended in 1920 for

use by beekeepers in moth control after experiments were conducted by Armbruster. References do not indicate that this material has been used extensively.

Formalin was recommended in 1924 by Whyte for use by British beekeepers in their fight against the moth. He says "for small lots use two ounces in a saucer for 24 hours. Dosage tables have not been devised for this material which may have a definite value in control efforts against the moth.

Calcium cyanide has recently been recognized as an effective fumigant for insect pests and rodents. It has been used by beekeepers for purposes other than the moth. It should prove popular as a material for use against the moth. Experiments are now being conducted to determine the dosage table and the optimum conditions for its use. It is readily available, cheap, no fire danger, but there is need for precaution on the part of the operator.

Carbon tetrachloride in combination with ethyl acetate was recommended in 1926 by Hutson for use against the moth. The material is made of six volumes of tetrachloride and four volumes of ethyl acetate. A partial dosage table has been compiled showing that 3 pounds of the mixture to 100 cubic feet for 24 hours kills all larvae but an exposure of 48 hours is necessary to kill all pupae. This dosage was not effective against the eggs. This material is not effective at temperatures below 60° F. There is no odor after the use of this material and while distribution is not wholly staisfactory yet the price is considered reasonable.

From the foregoing it must be evident that very little is really known about control measures for the beemoth. There is need for extensive work on many possible methods of reducing the ravages by this pest. Some of this work is now under way and it is hoped that effective measures may be made available for the destruction of this ever present pest of the apiary.

Repellents for the control of the moth have received very little consideration from research workers or beekeepers. In 1920 it was reported in Germany that moth injury was less when a hive stood on a sheet of tin than when the usual floor board was used. Another item from Germany suggests the practice of wrapping up combs in newspaper to protect them from the moth. A very interesting observation comes from Germany that tomato leaves, whether green or dried, are very effective in keeping away moths.

Superheating is a possible type of control for the moth. This has apparently received no attention from workers on the moth although heat has been effective against other pests whose work of destruction is

the same in general. It is known that many insects succumb to high temperatures after a long exposure. The relatively low melting point of wax or the combs has probably discouraged effort along this line of control.

Cold has long been recognized as a factor of control for the moth. But no experimental work has been done to determine the effective temperature. In 1905 it was reported that 10 F° would kill larvae but nothing further has been given out.

THE RELATION OF FLIES AND FLY SPRAYS TO MILK PRODUCTION

By STANLEY B. FREEBORN, *Associate Professor of Entomology*, WM. M. REGAN, *Professor of Animal Husbandry* and ARTHUR H. FOLGER, *i/c Advanced Registry*, *University of California Agricultural Experiment Station*, *Davis, California*

ABSTRACT

1. This paper presents data gathered to check results secured during the summer of 1925 and to attempt to ascertain the causes for losses in production that resulted from spraying.

2. Exposing high producing cows to an exceedingly heavy infestation of house flies did not result in lowered production.

3. In the absence of flies, sponging with water had no effect on production, spraying, with water caused a loss of 5.4 per cent, with pine tar-creosote a loss of 6.9 per cent, and with oil a 9.7 per cent loss.

4. During the last two weeks of spraying the loss in production was 12.5 per cent for the pine tar-creosote and 22.8 per cent for the oil sprayed group.

5. The body temperature was consistently higher, sometimes as much as 3 degrees F., for the oil sprayed group than for the controls. The respiration rate of the former averaged 40 per cent higher than that of the latter.

That high producing dairy cows exposed to a heavy infestation of flies suffered a slight loss in production and that the application of commercial fly spray with a base of petroleum oil caused a further reduction were the conclusions drawn from an experiment conducted by the authors in the summer of 1925 at the University of California Experiment Station, College of Agriculture, Davis, and reported in the JOURNAL OF ECONOMIC ENTOMOLOGY *18*:779–790.

The loss attributable wholly to flies in this previous trial was as follows: horn flies, 1.4%; house flies, 3.33%; stable flies, 9.26%. When a bland, non-toxic oil was applied in the presence of stable flies, the loss in production was 21.0%; in the presence of horn flies, it was 13.1%. Pyrethrum extracted in a light oil was added to the spray described above and

applied in the absence of flies. The resulting loss in production was 4.3%; when stable flies were present, it was 12.4%.

During 1926 an attempt was made to ascertain the reasons for these losses and to check the results of the previous season. Eight cows of good production and approximately in the same period of lactation were confined in pairs in screened stalls.

Group A, the controls, was left untreated throughout the experiment, no flies being allowed in their stall. Group B was given a rest of one week after entering the stall. During the second week, they were sprayed with water daily to ascertain the effect of the mere act of spraying. During the following two weeks, a light application of non-toxic, colorless petroleum oil was made daily. During the next two weeks this spraying was continued, and from 5,000 to 10,000 house flies were liberated in the stall each day, the flies up to this time having been excluded. There followed then a period of two weeks without spraying but with the daily addition of flies. During the last week of the experiment, the flies were excluded and the cows kept under normal conditions.

Group C was treated exactly as Group B, except that a pine tar-creosote spray was substituted for the oil spray of Group B during the periods in which the cows were sprayed.

Group D, after the first normal period of seven days, was sponged with water daily for a week as an alternative to the water spray received by Groups B and C. During the next six weeks, from 5,000 to 10,000 house flies were liberated each day in the stall. All flies were excluded during the closing week of the experiment.

The curve of decrease shown by the controls was taken as the normal expectancy for all cows, inasmuch as all were in approximately the same stage of lactation. This curve was then superimposed on the actual production graph of the test animals and their amount of increase or decrease above or below their expectancy was computed.

Spraying Versus Sponging. Because of the possibility that the mere act of spraying rather than the effect of any particular spray used might cause the cows to become nervous and thus bring about a loss in production, two groups, B and C, were sprayed with tap water, one group, D. was sponged, and the controls, A, were left untreated. As shown in Figure 1, the sprayed cows, B and C, fell 5.36 and 5.52%, respectively, below their expectancy, while the sponged cows remained .55% above, and the controls showed no tendency to fall. These figures indicate that spraying, even with water, has a tendency to lower milk production at least temporarily. Although there was no upward trend during the one week of this trial, it is very probable that after a longer

period the animals would have become accustomed to the strangeness of the procedure and regained their normal production.

SPRAYING WITH REPELLENTS. The two sprays used in the present trials were, (1) a bland, non-toxic, colorless and tasteless oil of eastern origin and (2) a pine tar-creosote spray. In the 1925 trials, the bland petroleum oil used was of western origin having a specific gravity of .8762, flash point of 310, and Saybolt viscosity of 105. To determine whether the physical characteristics or toxic end products were responsible for the lowered production during the first year's trials, the oil used in 1926 was of eastern origin, having a specific gravity of .8363, flash point of 340, and Saybolt viscosity of 68.

The pine tar-creosote spray was a combination of commercial creosote and pine tar emulsified with sodium hydroxide to form a stock solution to be diluted with water. Two different stock solutions were prepared. The first was composed of 100 cc. of creosote and 400 cc. of pine tar, to which 40 grams of sodium hydroxide were added in a liter of water and thoroughly mixed. This was then added to tap water, due allowance being made for the liter of water already added, to make a 1, 2, and 3 per cent spray. The other stock solution was made by combining equal parts of pine tar and creosote, after which the same method of emulsifying and diluting was followed.

TABLE 1

	After Spraying %	24 Hours Later %	Average Efficiency %
Eastern White Oil	91.93	74.55	83.24
Creosote 100			
Pine Tar 400			
1%	69.31	61.83	65.57
2%	75.65	74.74	75.69
3%	82.22	75.21	78.71
Creosote 250			
Pine Tar 250			
1%	83.34	76.71	80.02
2%	74.02	76.69	75.35
3%	82.66	79.98	81.32

These sprays, together with the oil spray, were then applied to animals in quantities just sufficient to insure coverage. During the first ten minutes after each application the number of flies that alighted on one side of each cow was taken. Control animals were observed at the same time and from these comparative counts the percentage of efficiency of each spray was computed. Twenty-four hours later, the same cows were

observed again and a comparison made with a control. The two averages, i.e., one immediately after spraying and another 24 hours later, were combined to give a single average that would express the efficiency after a 24 hour period.

A study of Table 1 shows that the oil spray was in a small degree the most efficacious repellent. Furthermore the spray containing equal

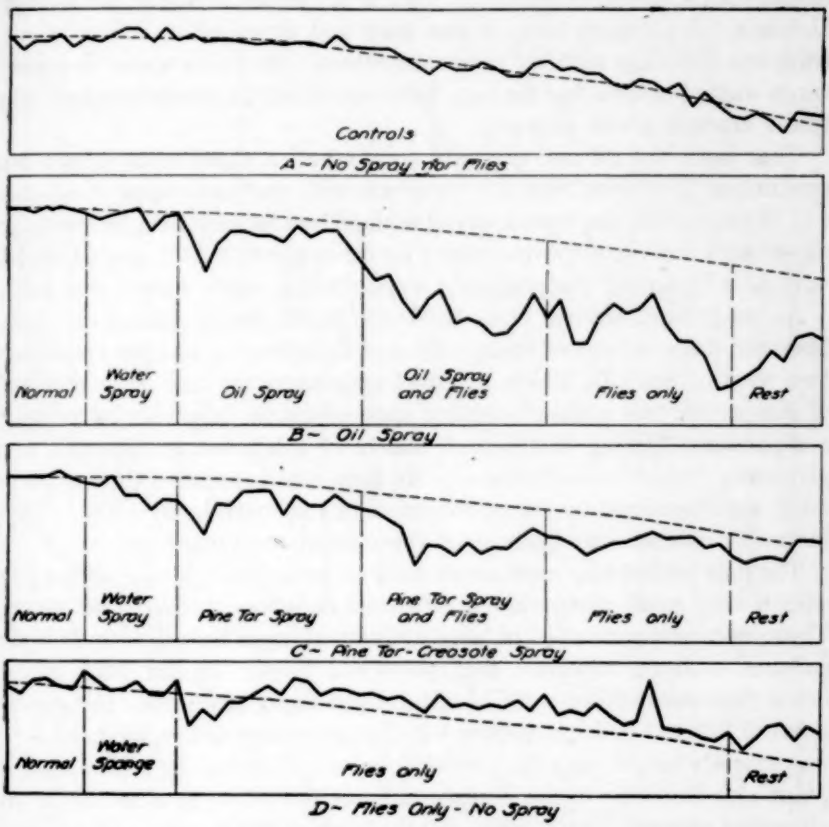

Fig. 31.—Chart of milk production. Dotted line represents expectancy.

parts of creosote and pine tar was more satisfactory than that having more pine tar than creosote. As a result of these trials, it was decided to use the 3% dilution of the former.

The physical appearance of the sprayed animals (dry stock was used in these trials) was very satisfactory. Neither spray caused the animals to pick up any unusual amount of dust or debris, and the condition of the skin showed no ill effects.

Any spray that will repel more than 80 per cent of the flies over a 24 hour period without injuring the coat or skin and without tainting the milk is decidedly a valuable adjunct, *providing* its application does not decrease the milk production.

The next step then was to measure the effect of this spraying in terms of milk production. Group B was sprayed once daily with the white oil in quantities varying from 250 cc. for a small Jersey to 500 cc. for a large Holstein. A pressure sprayer was used and every effort made to get complete coverage without excess anywhere. As much spray is necessarily wasted in spraying the legs, belly and head, no animal received the whole amount given above.

That both the oil and creosote sprays had a detrimental effect on production is evident from a comparison with the water spray. At the end of two weeks, the cows sprayed with oil had fallen 9.74% below their expectancy and those sprayed with pine tar-creosote, 6.93% as contrasted with 5.52 % during the preceding week when a water spray was used.

As mentioned before, from 5,000 to 15,000 house flies were then liberated daily in both of these stalls and the spraying was continued for two weeks. Stall D, which received approximately the same number of flies as the two stalls containing sprayed cattle, offers an interesting comparison. During this period, the cows subjected to flies but not given any protection or damage by fly sprays had exceeded their expectancy, as determined by the performance of the controls, by 1.8%. This favorable balance was maintained throughout the experiment.

The flies used in this experiment were all house flies (*Musca domestica*) with a very small percentage of *Muscina stabulans* and *Eristalis tenax*. These were easily trapped in large cylindrical cages baited with 24 hour cultures of bran, molasses, and powdered yeast. In the 1925 trials, house flies were shown to be of some slight importance from the standpoint of lowered milk production but the percentage determined,—3.3.—was scarcely larger than the probable error. It should be added at this point also that one of the control animals fell off in production in an abnormal manner, which consequently lowered the average expectancy. For this reason, the slight reduction, if any, caused by fly infestations did not become evident, and the losses from spraying were minimized. With these facts in mind, it is safe to assume that under the conditions of the trials, no damages by fly infestation were recorded, all losses being chargeable to spraying alone.

Thus, the loss from spraying for the second period was 12.5% for the pine tar-creosote and 22.81 % for the oil sprayed group. During this

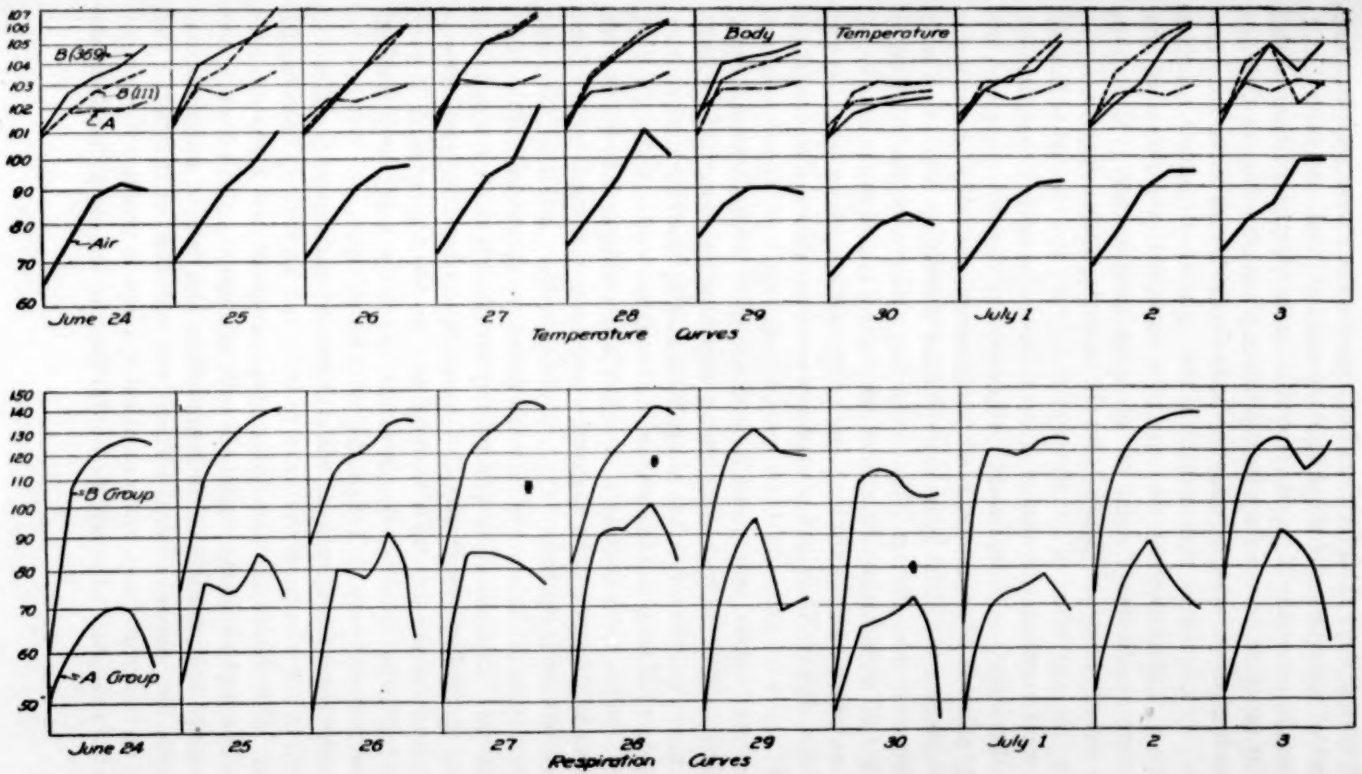

Fig. 32.—Curve of body temperatures and respiration rates of control (A) and oil sprayed group (B). Mark X in the respiration curves denotes high point pine tar-creosote sprayed animals. Note curves for June 30, a cool day and drop on July 3 when sprayed animals were washed with soap and water.

period, several days of high atmospheric temperature were recorded, and the clinical appearances of the animals sprayed with oil were such that it was thought necessary to refrain from the further spraying of one of the cows, in order to prevent a pneumonic complication. Fig. 32 shows in graphic form the relation between the body temperatures of the two cows sprayed with white oil, the average of the unsprayed controls, and the atmospheric temperature. As would be expected, the curve of the respiration duplicates the curves of body temperatures. These are shown directly below in Figure 32 for the same days, the upper line representing the respiration of the oil sprayed animals and the lower that of the normal controls. A study of these curves makes it evident that while the body temperature and respiration of normal cows are but slightly affected by increases in air temperature, the body temperature and respiration of the oil-sprayed cows show a striking correlation with the temperature of the air. The body temperatures of the cows were taken for 25 days at two hour intervals during ten daylight hours and were compared with the readings from a recording thermometer kept in the occupied shed. The result of studies of these data showed a correlation of $.6841 \pm .019$ between the air temperature and the body temperature of the controls. On the other hand, a similar study of the body temperature of the oil sprayed animals and the air temperature shows the striking and almost perfect correlation of $.95679 \pm .00387$. Similar studies were also made with both the controls and oil sprayed cattle and with both wet bulb readings and "effective" temperature readings. The latter were determined by bisecting the angle on a psychrometric chart between the dry and wet bulb readings. Both of these studies failed to yield the striking results of the correlation with the air temperature. A possible explanation of this lack of correlation may be found in the fact that under Sacramento Valley conditions the humidity in summer is inversely proportional to the dry bulb reading, and as the temperature is constantly high, the "effective temperature" is merely a dry bulb reading modified in its severity by a slight degree of humidity.

The two cows being sprayed with oil reacted in an entirely different, although to one who knew the cows' records, not an entirely unexpected manner. The Holstein, soon after the advent of the spraying procedures, began to decrease rapidly in milk production, and although her temperature and respiration indicated that she was in an abnormal condition, her general clinical picture was not that of distress. The Jersey, on the other hand, made a valiant attempt to produce the normal amount of milk, and although she fell far short of the mark, her decrease

was not precipitous as in the case of the Holstein. The result of this effort, however, showed in her physical appearance which was that of extreme weakness. On the advice of the University veterinarians spraying was discontinued and the animal washed repeatedly in order to prevent serious illness. The clinical pictures of these two animals led to the belief that production might be a factor in the complex. To determine this point, a group of steers was sprayed heavily and their body temperatures and respiration rate were taken every two hours. This group of non-producing stock showed no increase in either of these measurements.

Unfortunately, no temperature records were taken for the group of cows sprayed with pine tar-creosote. However, their respiration was noted on some of the same days shown in the graph of the oil sprayed cows, and their high peak is marked with an X. With this fragmentary evidence, which is, at most only an indication, it may be assumed that they, too, reacted to the spray in an unfavorable manner as is shown by their 12.5% loss in production during the second spray period. Their recovery was relatively rapid, however, when compared to the oil sprayed animals.

One conclusion that might be drawn from this experiment is that the oil forms an impermeable layer over the surface of the body, preventing evaporation and the interchange of gases and thus inevitably forces up the body temperature and increases respiration. The pine tar-creosote spray, while not producing similar results immediately might do so in time. The evaporation of this spray on a clean glass slide leaves a thin viscid film, which through daily additions would soon produce a covering fully as effective as that formed by the oil. An animal that is not producing to capacity would probably be able to withstand the added labor of increased respiration in compensating for the impaired function of the skin. A high producing cow covered with an impermeable layer of material, however, even though she be standing idle in the stall is working under a handicap comparable to that of a draft horse which is expected to pull a capacity load on a hot day, muffled from head to foot in blankets.

As a result of these two years of investigation it is evident that the loss to dairy production caused by flies is sometimes greatly overestimated and that often greater damage to the cows results from the spray than from the flies.

PETROLEUM OIL AS A CARRIER FOR NICOTINE[1]

By E. R. DE ONG

ABSTRACT

The value of petroleum oil as a spray is not confined to its insecticidal value alone but includes a potential value as a carrier for other and more active chemicals which may act as insecticides and fungicides or perform functions which we may not now recognize.

Experiments performed on the Brown Apricot Scale have shown a material increase in toxicity by the addition of small amounts of nicotine to oils, especially kerosene.

The potential value of petroleum oil as an insecticide for use on plants has long been recognized but its general application both as a dormant and foliage spray was made possible only by the use of the more highly refined fractions containing a minimum of unsaturated hydrocarbons. The establishment of this practice has removed petroleum oil from the list of doubtful reagents to one of recognized value. This change in the status of petroleum oil opens the way for manifold uses not alone as an insecticide but from the physiological standpoint, for example, in retarding excessive transpiration of moisture. Another and perhaps more important field is in combination with other chemicals which may give an increased insecticidal value or as a carrier for fungicides, herbicides and even disinfectants.

The work with nicotine sprays in the past has been largely under the limitation of water as a carrier. But water will not "wet" the surface of a leaf as will oil, nor penetrate the insect's tracheal system; nor will it dissolve the waxy covering of armoured scales or the secretion of mealy bugs and woolly aphis. Hence the present study of attempting to increase the toxicity of both nicotine and oil by using them together.

Combinations of oil and nicotine have been used in the past but on account of the dangerous types of oils then available, the use was generally restricted to dormant trees or with a frank recognition of the fact that the risk from the use of oil was less than that of allowing some pest to go unchecked. We have now reached the opposite extreme in that the oils used are so inert as to lower their insecticidal nature, but their potential value as wax solvents, penetrants of minute apertures or their wetting powers are retained. The next logical step then is to combine the native values of the refined oil with the toxicity of nicotine or the fungicidal value of copper or other materials and thus improve the efficiency of each.

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[1]This work was begun in the University of California Agricultural Experiment Station and continued as a cooperative study with R. B. Arnold, Research Chemist of the Tobacco By-Products & Chemical Corporation.

One advantage which may be expected from such combinations is that volatile oils, safer to use on foliage than more viscous ones, may act as a carrier for nicotine just as well as those of a less volatile type and thus efficiency as an insecticide may be maintained and some of the difficulties eliminated which have arisen from heavy viscous oils. The volatile oils are also cheaper than the more viscous types.

Considerable experimentation has been completed on the mealy bug (*Pseudococcus gahani* Green) with oil and nicotine combinations, but as yet the work is not sufficiently complete to warrant publishing. The results thus far indicate that an oil of the type of No. 2 is the most promising. The oil alone however, is not sufficiently active in itself but we are now approaching satisfactory control with some of the nicotine combinations.

TABLE 1. COMPARATIVE TOXICITY OF OIL AND OIL AND NICOTINE ON BROWN APRICOT SCALE (*Lecanium corni* Bouche)

Material Used	Emulsion	Mortality	Range	Summary of Mortality
Oil	%	%	%	%
No. I[1]	1	80.1	74.3–85.9	Average percentage of oil alone 79.5
No. I	2	78.3	56.3–93.8	
No. I with .01 Free Nicotine[2]	1	92.4	91.9–93.0	Average percentage of oil and nicotine 92.4
No. I with .02% Free Nicotine	2	92.5	81.3–98.9	
No. II	1	92.8	92.1–93.5	Average percentage of oil alone 94.8
No. II	2	96.8	94.9–99.3	
No. II with .01% Free Nicotine	1	94.2	90.9–97.6	Average percentage of oil and nicotine 96.4
No. II with .02% Free Nicotine	2	98.6	92.3–100	
No. III	1	90.2	88.9–91.6	Average percentage of oil alone 91.7
No. III	2	93.2	88.2–96.5	
No. III with .01% Free Nicotine	1	94.9	94.5–95.4	Average percentage of oil and nicotine 95.4
No. III with .02% Free Nicotine				
No. IV	1	89.3	88.5–90.1	Average percentage of oil alone 88.8
No. IV	2	88.3	74.0–96.7	
No. IV with .01% Free Nicotine	1	92.1	98.1–92.5	Average percentage of oil and nicotine 93.6
No. IV with .02% Free Nicotine	2	95.1	82.8–100	
Control		66.6		

[1]Specifications of Oils used given in Table 2.

[2]A commercial grade of Nicotine, 95% purity.

TABLE 2. PROPERTIES OF OILS USED

No.	Gravity B	Flash Point F	Fire Point F	Viscosity at 100 F	Color	Sulfur %	Unsulfonated Residue	Acidity
			Kerosene					
I...	35.9	124CT	——	375	——	——	81	——
				Light Lubricating Oils				
II..	35.0	——	——	55–60	——	——	80	——
III.	28–31	280–	——	70–80	25	.015	98	.0
IV.	29.8	320	360	106	25	.006	98	.0

The most complete data we have is on the Brown Apricot Scale (*Lecanium corni* Bouche), as given in Table 1. A comparison of the summary of mortalities will show a decided advantage of oil-nicotine combinations over oil alone. The difference between the types of oils themselves is not as great as that between oil and oil-nicotine combinations. It will also be seen that nicotine and kerosene may be just about as effective as a lubricating oil and nicotine. The cost of kerosene would, however, be about one-fourth that of the heavier oil, while the latter would be much less safe on foliage. It will also be noted that oil No. IV, with a viscosity of 100–110 sec. is less effective than No. 11, with a viscosity of 50–60 seconds.

While the nicotine-oil combinations do not seem to offer much advantage for dormant spraying, the use of these combinations for foliage applications appears very promising.

NOTES ON OIL-EMULSIONS WITH SPECIAL REFERENCE TO APHIS ON APPLE

By S. W. FROST[1]

In 1924 some investigations were started with cold-mixed oil emulsions but it was found necessary to discontinue this work. A few figures were gathered which seem worthy of mention. They show that a degree of control of the rosy aphis, *Anuraphis roseus* Baker, can be obtained with a delayed-dormant application of oil.

The emulsions were all mixed in the same manner using one pound of Calcium caseinate, three gallons of engine oil, and one hundred gallons of water. (In preparing large quantities, it was found convenient to mix

[1]Published by permission of the Director of the Agricultural Experiment Station as a part of Project No. 696. Contribution from the Department of Zoology and Entomology. Technical paper No. 426.

the stock solution in the spray tank using two guns to keep the material thoroughly agitated.) Several brands of engine oil, donated by the Sinclair Refining Company and the Texas Company were tried. Kerosene was used as a very volatile and light oil while Sunoco was used as an oil of high viscosity.

One series of tests was conducted at the laboratory. Infested branches were gathered from an apple orchard on April 9th. These were held in a clamp and sprayed first from one side, then from the other, using a good hand sprayer with a "Vermorel nozzle," and 50 pounds pressure. When spraying the nozzle was held three or four feet from the branches. Two tests were conducted: one giving the branches a very light application, allowing only the edges of the mist to strike the branch, the other a drenching application. The aphid counts were made the following day while the red-spider counts were not made until a week later, when the check branches showed that the eggs were hatching.

RED-SPIDER COUNTS

Material	Analysis of Oil			Lightly Sprayed	
	Base	Viscosity[2]	Specific Gravity	Number Spiders	% Kill
Water	——	——	——	1299	6.5
Kerosene	?	about 10 sec.	?	1659	9.7
Miner's Neutral[1]	Paraffine	50 sec.	34½–35½	1232	69.5
Corvus[1]	Paraffine	70 sec.	28–30	1827	70.1
Alweather[1]	Asphaltum	100 sec.	21–22	866	65.5
Nabob[1]	Asphaltum	200 sec.	20–25	742	76.0
Coss[1]	Asphaltum	200 sec.	19.7–20.7	647	60.6
Sunoco[1] 1–20	?	about 2000 sec.	?	——	——

[1]Trade names.
[2]Saybolt at 100° F.

APHIS COUNTS

Material[3]	Lightly Sprayed		Drenching Spray	
	Number Aphids	% Dead	Number Aphids	% Dead
Water	218	.4	158	1.2
Kerosene	98	4.1	177	41.4
Miner's Neutral	72	1.3	107	98.2
Corvus	——	——	173	100.00
Alweather	200	7.5	70	100.00
Nabob	67	7.4	157	99.4
Coss	175	20.0	181	100.00
Sunoco 1–20	170	44.7	137	100.00

[3]Same analysis as in preceding table.

A second series of tests was conducted in an apple orchard. Four blocks of trees, including at least 100 trees in each block, were sprayed April 13th with different cold-mix emulsions using the same formula as was used in the previous tests. Counts were made on June 1st of leaf clusters infested by rosy-aphis, with the following results:

APHIS COUNTS, PITZER ORCHARD, 1925

Material[1]	Total No. Clusters	Number Infested Clusters	% Infested Clusters
Check	520	71	13.6
Nabob	1029	29	2.8
Kerosene	1000	25	2.4
Lime Sulphur	1070	70	6.5

[1]A 3% emulsion with Calcium caseinate was used in each case.

The following year a second test was conducted in another orchard, giving similar results. Sunoco oil was used in the Delayed dormant application at the rate of 1–20, applying it with 200 pounds pressure. Immediately after spraying branches were cut from the trees and all buds which had not been wet by the spray were removed. In this way it was certain that every bud and all the branch was thoroughly covered with oil. Under these conditions a count was made the following day showing a 100% kill. But, when branches were selected at random from the same orchard sprayed in the same manner the count showed only a 38.3% kill. It is very evident therefore that even under the best of spraying conditions and greatest of care, only a comparatively small percentage of aphis can be killed. Drenching on the other hand certainly gives a high percentage of kill.

Further tests of immunity from burning, where cold mixed emulsions were used, were tried on two year old and twelve year old trees. Burning was in no case noted even where such oils were applied as late as June. Some of the tests are summarized in the following table:

TESTS OF OIL EMULSIONS TO DETERMINE IMMUNITY FROM BURNING

Emulsified with Calcium Caseinate[1]	% of Oil	Date of Application	Age of Trees	Results
Kerosene	1½	May 5	2yrs.	no burning
Kerosene	3	May 5	2 yrs.	" "
Kerosene	3	May 6	12 yrs.	" "
Kerosene	3	May 6	12 yrs.	" "
Red Eng. Oil	3	May 6	12 yrs.	" "
Red Eng. Oil	3	May 6	12 yrs.	" "
Red Eng. Oil	3	May 6	12 yrs.	" "
Red Eng. Oil	1½	May 6	12 yrs.	" "

[1]All emulsion made with one pound Calcium caseinate and 100 gallons of water, with oil sufficient to make the desired percentage.

CODLING MOTH BANDING MATERIALS

By B. A. Porter and R. F. Sazama,
United States Bureau of Entomology, Vincennes, Ind.

Abstract

Preliminary tests of several materials for codling moth banding are here reported. The results indicate that corrugated paper may have a practical value as a banding material, and that tarred paper, corrugated paper, and a tough crepe paper appear to be more effective than burlap. There is need of further tests of different materials, as well as a study of the reactions and behavior of the mature larvae while in search of cocooning quarters.

Because of the present spray residue problem, a renewed interest has developed in mechanical means of reducing codling moth population to a point where a shortening of the spray schedule may be possible. Entomologists who are wrestling with this problem may be interested in the following summary of preliminary experiments which were made in Indiana during the fall of 1926 with several materials which have been suggested for this purpose.

This work was carried on in a block of Winesap trees approximately 25 years old. The trees were fairly uniform in size, bore a heavy and uniform crop of fruit, and the worm infestation was severe. The different types of bands were so placed that the influence of the packing shed, a few hundred yards away, would be approximately equal on all groups. Before the trees were banded, the trunks and larger branches were scraped. The bands were put on September 3rd and 4th, and were examined November 2nd and 3rd. During this period none of the larvae transformed, so that repeated examinations were unnecessary.

Materials Used

The following materials were tested:

Burlap. This is the present standard material for most sections. The burlap used was about a 9-ounce weight, and it was used triple thickness, six inches wide.

Tarred Paper. Flint[1] reported in 1917 that a tarred building paper was more effective than burlap in trapping the worms, and has since accumulated further evidence in confirmation of this report. In the tests here described, a cheap, light weight roofing paper was used, in strips six inches wide.

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[1]Flint, W. P. 1918. The Use of Tarred Paper Bands for Trapping the Larvae of the Codling-Moth. Transactions of the Illinois State Horticultural Society for 1917, Vol. 51, n.s., p. 174–177.

CORRUGATED PAPER. The grower in whose orchard this work was done had used strips of corrugated paper with considerable success. In these tests, double faced corrugated paper was used in strips three inches and six inches wide, cut across the corrugations.

CREPE PAPER. This grower has also used for banding purposes a tough, heavy, crepe paper of the type used in wrapping automobile tires and rolls of wire, and for lining barrels. This paper is double, the two layers being cemented together with some black tar-like substance. Our tests did not include this material, but at the time when the other bands were examined, it looked so promising that records were secured from an adjacent row which the grower had banded. These bands were in place five days before ours were, but the trees had not been scraped. This undoubtedly reduced the efficiency of the bands more than enough to offset the advantage gained by the additional five days that the bands were in place.

At the time of examination, several of the corrugated paper bands had been torn open by birds in search of worms, so the figures are not complete, although they represent very nearly the total number caught.

The number of worms trapped by the different types of bands is summarized in the following table:

CODLING MOTH BAND RECORDS—SUMMARY

Mitchell, Ind., 1926

Band	Number of Trees	Number of Worms	Average per Band	Remarks
Burlap, 3 thicknesses, 6 inches wide	20	1753	87.6	
Roofing paper, 6 inches wide	20	2667	133.4	
Corrugated paper, 3 inches wide	10	2669	266.9	One band slightly torn, 2 badly torn by birds.
Corrugated paper, 6 inches wide	10	3233	323.3	Three bands slightly torn 2 badly torn by birds.
Crepe paper, 3 inches wide	20	2052	102.6	Put on by owner of orchard 5 days before the rest of bands; trees not scraped.

DISCUSSION

A few points of interest are suggested by these results.

Burlap, which is probably the most widely recommended material for codling moth banding, caught the smallest number of worms. This agrees with the results obtained by Flint, who found that burlap bands trapped only about one-half as many worms as tarred building paper,

and also agrees with the experience of the grower in whose orchard the work was done, that burlap was the least effective of the materials used.

About 90% of the worms trapped in the corrugated paper bands go into the corrugations, which necessitates replacing the bands at each examination. The bands which have been removed should then be destroyed, or treated by heat or by some other method, to kill the larvae and pupae, in which case they could be used again. It has been suggested that after removal from the tree, these bands could be placed in tightly screened rooms to permit the emergence of parasites and their return to the orchard.

The corrugated paper used in the tests was double-faced. Single-faced material is cheaper and is easier to handle, being more flexible. If used with the corrugations next to the tree, it might be as effective as the double-faced material.

If bought new, and destroyed at each examination, corrugated paper would be considerably more expensive than the other materials, but a moderate increase in the efficiency of the bands might justify an additional expense. The grower in whose orchard this work was done used waste trimmings which he obtained from a corrugated paper factory, in strips one and one-half to four inches wide, at a rather low cost. He also used this material rather extensively in his packing shed, around posts and along the walls, to trap worms which emerged from cull fruit.

In wet weather the corrugated paper absorbs moisture and has a tendency to swell, but if tacked securely in place, it does not fall apart, and appears to lose none of its effectiveness. Whether corrugated paper would be practical for extensive use in commercial orchards can be determined only by actual experience.

A possible explanation of the apparently greater efficiency of the tarred paper and the crepe paper as compared with burlap seems to be the fact that these papers are not penetrated by light, whereas ordinary burlap allows the passage of some light. As was indicated by experiments which Siegler and Plank[2] conducted with white and black bands, it seems probable that the larvae are in search of the darkest available crevices for cocooning quarters. Further experiments are needed with the materials mentioned in this paper, as well as with a number of others which might be of value.

These results suggest the desirability of an intimate study of the behavior and reactions of the larvae after leaving the fruit, to ascertain

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[2]Siegler, E. H., and Plank, H. K. 1921. Life History of the Codling Moth in the Grand Valley of Colorado. U. S. D. A. Bulletin 932.

the various factors which influence the selection of cocooning quarters—darkness, different types of surface, and so on. It may be found that the reactions of hibernating larvae are different from those of larvae which transform the same season and need protection for a much shorter period.

If the efficiency of banding and similar mechanical means of codling moth control can be increased, such measures will be more generally adopted, and will aid materially in the solution of the spray residue problem, as well as in codling moth control in general.

Scientific Notes

The Use of Arsenicals in French Vineyards. We all know that, while the use of arsenical poisons has been tolerated to a slight extent in the vineyards of France, it has not been officially permitted. However, the Minister of Agriculture issued an order on February 25th, last, permitting the employment of arsenicals in vineyards between the date of the vintage and the time when the grapes begin to darken the next season. That leaves a long period in which the grape vines may be sprayed with arsenicals. This item is contained in a letter from the Minister of Agriculture to the Permanent Secretary of the Academy of Agriculture of France, published in the Comptes Rendus of the Academy of Agriculture of France (meeting of the 7th of March).

L. O. HOWARD

Preliminary Tests of Ozone as an Insecticide. Experiments on June 29, 1926, with house flies, honeybees, flea beetles, aphids, house fly maggots and meal worms, exposed in a dessicator to a continuous flow of ozone in air, at a concentration of 4 mgs. per litre, showed decided lethal action against the adult insects in exposures ranging from twenty-five seconds to five minutes. The action of ozone on the larvae was undetermined, due to factors which interfered with a correct interpretation of the data. It is planned to continue these experiments with the idea of determining the adaptability of ozone treatments to the control of stored product pests.

E. N. CORY AND H. B. MCDONNELL

A Note Regarding Temperature Curves. Since the appearance of my paper on variable temperatures (J. Econ. Ent. 20:769–782) Dr. V. E. Shelford has called to my attention a paper by Matisse (Action de la Chaleur et du Friod sur l'Activite des Etres Vivantes, 556 p. Paris, Emile Larose 1919) in which he used a three dimensioned diagram for showing the relations between time and temperature and the rate of movement of certain lower organisms.

His figure differs from the one in my article in that the highest rate comes near the moment of exposure to high temperature and the rate decreases exponentially with time. In the case of CO_2 production the rate increased for several hours, and then decreased.

The equation found by Matisse for the relation of temperature to rate of movement seems of fundamental importance. It is, in its simplest form

$$v = e^{-\frac{A}{\theta}(\lambda - \mu\theta)}$$

Where v = velocity

e = base of natural logarithms = 2.71828

θ = temperature above an arbitrary zero for the particular reaction.

A, λ, μ are arbitrary constants, determined from the data.

For the use of this curve the reader must refer to the original memoir, as the mathematics of fitting are too long for reproduction here.

WILLIAM C. COOK, *Montana Experiment Station, Boseman, Montana*

Naphthalene Control of Red Spider and other Insects on Miscellaneous Crops in the U. S. Department of Agriculture Greenhouses. Red Spider is particularly difficult to control on strawberries under glass in winter because the foliage lies close to the ground. W. H. White of the Bureau of Entomology suggested the use of naphthalene vapor as recommended by Hartzell,[1] i. e., one and one-half ounces per 1,000 cubic feet evaporated over a period of six hours in a humidity of 80% and a temperature of 70°F. Four night fumigations at one to several day intervals entirely controlled the red spider, killing eggs as well as adults but, as noted below, the fumigations were above the recommended strength. In addition, ants above ground were killed and no more appeared for about two weeks; apparently the fumigant acted as a repellent. White fly adults, but not eggs, aphids above ground and some, but not all, mealy bugs were killed.

Fumigation was begun between 4 P. M. and 4:30 P. M. with lamps set to run about six hours, and the house opened at daylight the next morning. By opening steam vents on the pipes a high humidity was obtained. No record was taken but at times the humidity was near saturation, at other times as low as 80%. Although the temperature was held close to 70°F, it ranged from 70°F to 86°F. Concentrations ranging from one to three times that recommended were used. In one house containing two varieties of strawberries, no injury was apparent even when as high as one pound per 3,500 cubic feet was used. No injury was evident on specimen plants of cotton, cucumber, chestnut, carnation, primrose, croton and lily placed in this house. Later, a second house containing many species and varieties of strawberries, raspberries and dewberries received two and three times the recommended dosage. Triple strength injured *Fragaria virginiana* var. *glauca* severely, and some horticultural varieties slightly although most varieties were uninjured. Citrus, crotons, grasses, poinsettias, ferns, arbor vitae and coffee were uninjured. One bramble species, *Rubus innominatus*, was slightly injured.

Both the lamp used to vaporize the naphthalene and the container should be well made. In the above tests alcohol lamps were used and in one instance the naphthalene was ignited. The ignited fumes severely injured the strawberry plants, though not the croton, bean, carnation, primrose or other plants.

It is felt that these notes should be of interest where the control of red spider is necessary in experimental plantings, especially where a number of different plants are grown in the same house.

GEO. M. DARROW, *U. S. Department of Agriculture*

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[1]Hartzell, A., 1926. Naphthalene Fumigation of Greenhouses, Jour. Econ. Ent. 10:780–785.

Developments in Trichogramma Production. At the Philadelphia meetings in December 1926, Professor E. O. Essig made a brief announcement of the methods developed by the writer for the artificial rearing of *Trichogramma minutum*. In the short period since that time information as to the equipment and technique used has been freely given to over a dozen entomologists in various parts of the world.

During the summer of 1927 a number of improvements were made by the writer over his original method which was essentially as described by Hinds and Spencer in the April issue of the JOURNAL OF ECONOMIC ENTOMOLOGY. It was found that by covering the corn bins with slats one-eighth inch apart and resting on the corn the bins could be built more compactly and thus conserve space. Instead of using the interspaces between two discs to obtain egg deposition it was found that when enough moths were placed in a smooth cylinder capped on each end with a 20-mesh wire screen their eggs dropped through the bottom screen. The crevices formed by the bodies of the moths stimulate egg-deposition.

The eggs are poured onto circular pieces of cardboard using shellac as an adhesive.

The most convenient containers for handling the parasites are petri dishes inverted on plate glass shelves.

Throughout the month of July 1927 the writer maintained a daily production of over 200,000 *Trichogramma*.

STANLEY E. FLANDERS

Phi Sigma Scientific Program. The Phi Sigma Society will offer a scientific program at the New York meeting, on Dec. 27th, which will be open to junior research workers, whether members or not, in any field of biological science. While it is not contemplated to lower the standard of excellence in any way, it is recognized that there are often younger investigators who have produced meritorious results but who are not, for various reasons, eligible to section programs or to the programs of the more advanced societies. It is the purpose of this society then to offer a place where such investigators may present such work. This plan has the approval of the A. A. A. S. The Council of Phi Sigma will offer a prize of at least $50.00 for the most meritorious paper presented on this program by a non-member. Those wishing to present papers on this program should report their intention to the Secretary not later than Nov. 15, 1928 and should submit a brief abstract not exceeding 250 words. It should be understood that in bringing this matter to the attention of the scientific public in this manner, it is not the purpose to advertise the activities of Phi Sigma but merely to bring the plan to the attention of those to whom this opportunity may be of assistance. Authors need not be present but may delegate the reading of a paper to some one who will be in attendance. The Council reserves the right to place any paper on a list to be read by title. Papers will be limited to 10 minutes. So far as possible all papers of any merit will be admitted to the program. Programs of this nature were presented at the Kansas City and Philadelphia meetings with participation limited to members of Phi Sigma. The results have seemed to justify expansion of the plan as outlined above.

C. I. REED

Spray Recommendations for Codling Moth Control, Washington, for 1928. These were prepared by Representatives of the Washington State Experiment Station, The Federal Bureau of Entomology and the Washington State Department of Agriculture.

1. The severity of codling moth infestation in the State of Washington depends on the temperatures at the time of emergence of the moth, length of growing season and degree of infestation the previous year. From year to year such infestation varies in intensity in different districts and in different orchards and in different portions of the same orchard. There is no reason to believe that the codling moth infestation is going to be less for 1928 than in former years.

2. Within a single district orchards vary in exposure, density of tree growth, type of cultivation, (whether cover crop or clean culture) and type of soil. All of these factors may affect the time of emergence and development of the codling moth.

3. Because of these variable factors specific spray recommendations cannot be given for an entire state or district. The spray program, while based on general principles, must be worked out in detail for each individual orchard.

4. Extensive experimental work for codling moth control was conducted in 1927 and will be continued in 1928. On the basis of this and former work, as well as practical results in commercial orchards the following is recommended as a guidance to the grower for 1928.

5. The general principles are here outlined for the guidance of the grower:

(a) Spray Treatment.

1. Arsenate of lead is the only known practical and effective insecticide that can be unconditionally recommended for codling moth control at this time. One pound of arsenate of lead to 50 gallons of water is usually sufficient. Heavier dosages are not recommended because of consequent difficulties of the residue removal.

2. Oil in combination with arsenate of lead has proven effective for codling moth control but is not recommended because of the possibility of injury to fruit and foliage. Oil alone is not as effective as either lead arsenate or the oil and arsenate combined.

3. Nicotine sulphate and other insecticides must be considered either ineffective or in the experimental stage. Do not use them except for experimental purposes.

4. The time of application, and number of sprays to be used will vary in different orchards and in different localities, and should be determined by each individual grower.

5. Major efforts for codling moth control should be directed toward first brood elimination.

6. The Calyx Spray should be applied before the calyx lobes have closed. Experimental evidence shows that this spray is important and should not be omitted.

7. The cover sprays should be timed carefully by the use of moth traps placed well up in trees, away from packing sheds or other buildings. The first cover spray should be completed within ten to twelve days after moths are caught in the traps. If thermometers are available, temperature records should be taken as soon as first moths are caught in traps. If the temperature is 60 degrees at dusk eggs will be laid and the first cover spray should be on the trees within ten to twelve days. Careful growers get the first worm for it is he that comes back to form the second brood.

8. On severely infested orchards cover sprays should be applied every ten days. In high altitudes or isolated orchards, having light infestation, one or possibly two cover sprays may suffice.

9. Cover sprays for first brood worms can stop ten days after moths practically cease to enter the traps. This usually comes five to six weeks after the first moths appear.

10. Second Brood Sprays: If there is an average of three to five worms per tree by July 1, or if moth traps show an increase in number of moths caught after July 1, one or more sprays for second brood should be applied.

(b) Thoroughness in all Sprays

1. Be thorough in spraying, cover every portion of the tree and give special atttention to the tree tops, since that is where the Extra Fancy apples grow and where most of the eggs are laid. Timeliness and thoroughness cannot be overemphasized.

(c) Supplementary Treatment

1. Destroy all overwintering larvae in warehouses, apple boxes, packing sheds and other buildings. Place all boxes within the packing shed of which all doors, windows and other openings are tightly closed during the spring and summer, in order to imprison the moths. Where a closed shed is not available all boxes should be fumigated. Avoid promiscuous transportation of infested apple boxes from one orchard to another.

2. Scrape rough bark from trees and burn to destroy overwintering larvae hibernating under the bark. This should be done to a depth of one to two inches below the ground.

3. Place moth traps well up in trees just before calyx spray is given, to catch many moths before eggs are laid.

4. Band trees June 1st and examine every ten days. Rough barked trees should be scraped before banding. The bands will catch approximately 45% of the worms that leave the apples.

5. Fruit should be thinned to break clusters and to remove wormy fruit. This should be destroyed and not buried.

These recommendations were signed by Station Director E. C. Johnson, R. L. Webster, Anthony Spuler, J. R. Magness, and M. D. Armstrong, Washington State College; E. J. Newcomer, U. S. Department of Agriculture, and J. I. Griner, George E. Harter, F. C. Neilson, and Wendell P. Brown, representing the Washington State Department of Agriculture.

JOURNAL OF ECONOMIC ENTOMOLOGY

OFFICIAL ORGAN AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

JUNE, 1928

The editors will thankfully receive news matter and other items likely to be of interest to our readers. Papers will be published as far as possible in the order of reception, except that papers of reasonable length may be accepted in the discretion of the editor for early publication at $2.50 per page for all matter in excess of six printed pages, a part page counting as a full page, this limit not including acceptable illustrations. Photo-engravings may be obtained by authors at cost.

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"WITHDRAWN FOR PUBLICATION ELSEWHERE"

Has the time not arrived to consider the unfairness of permitting a paper to be read at the annual meeting of the American Association of Economic Entomologists and then allowing it to be "Withdrawn for Publication Elsewhere?" Too often the paper is not published elsewhere at all; occasionally it is so changed as to be unrecognizable to those who may wish to read it as originally presented.

If a paper is worth reading, it is worth printing, and printing as read. If a paper is worth printing, it is worth submitting promptly to the Editor so that he is not forced to print the above caption after the title and the name of the author.

Reading papers by title is, happily, passing out of fashion. Papers at the annual meeting of the Association are not accepted for reading unless the author is present to read it. Would it not be just as fair to require that all papers read be submitted for publication immediately after reading?

V. I. SAFRO

There is considerable of value in the above. Papers read at a meeting should be represented in the published proceedings by an abstract at least. A public discussion should be available in its essentials to all members and so far as possible to all interested in the same special line. This gives opportunity not only for criticism but suggestion. The suggestion that papers be submitted promptly for publication to the Editor is a very practical one. Were this carried out, the Editor would

know just about how much matter is on hand or how much there may be in the proceedings of a meeting or series of meetings, something very difficult to estimate under present conditions.

The Fourth International Congress of Entomology to be held at Ithaca, N. Y., August 12–18 promises to be the largest and most successful gathering of its kind, since there is practical assurance of the attendance of a hundred foreign Entomologists. It is safe to assume that there will be several hundred of the leading American Entomologists and the total attendance may run well toward a thousand. The gathering is destined to rank as one of the great scientific world congresses. The preliminary announcement indicates four general sessions with papers of broad interest to be presented by leading Entomologists of the world. The afternoons are to be devoted to meetings of sections and subsections dealing with various phases of taxonomic, morphological, ecological and genetical entomology. There are also sections upon medical and veterinary entomology, apiculture and general economic entomology, the last divided into five subsections. A week's time with such an inclusive program cannot fail to draw a large attendance from all sections of America. The committee in charge has also planned a comprehensive excursion, or series of excursions to include the more important entomological centers of the northeastern United States and for those who are interested in the scenic wonders of America there is an excursion to Niagara Falls. Provisions have been made for accommodations at reasonable rates, there even being opportunities for camping on the campus of Cornell University.

Obituary

GUSTAVE E. BENSEL

GUSTAVE E. BENSEL was born in Louvain, Belgium, on September 27, 1876. He received his education in the Belgium Agricultural College of Gembloux, from which school he received a diploma as Agricultural Engineer in 1899. For the first two years after leaving college, he was employed in the beet sugar industry of Belgium.

He came to America in 1902 and since that time has been connected with the sugar industry, principally in connection with agricultural research work where his broad fundamental training permitted achievement of valuable results in several branches of the field.

The Bureau of Entomology has lost a valued and respected collaborator in the passing of Mr. Bensel, whose death occurred on April 2, 1928, at Spreckels, Calif. His interest in the sugar-beet leafhopper problem was very great and his contributions of no small importance. These were never published, but the manuscripts were cheerfully handed on to his colleagues.

He was a member of the American Association of Economic Entomologists, the Entomological Society of America, and the American Association for the Advancement of Science.

His quiet personality and sincerity of purpose, coupled with a fine gentlemanly courtesy endeared him to his friends who mourn his passing, but who will remember him as one whom it was a privilege to know and a joy to work with.

WALTER CARTER, *Associate Entomologist,*
U. S. Bureau of Entomology, Twin Falls, Idaho

Current Notes

According to *Science*, Professor and Mrs. T. D. A. Cockerell left Siam in April for Australia.

Mr. O. T. Deen, of the Bureau of Entomology, was transferred from Picayune to Biloxi, Miss., on February 20.

Science reports that Professor J. Ritzema Bos has died at Wageningen, Holland, at the age of 78 years.

Mr. D. J. Caffrey, U. S. Bureau of Entomology, Toledo, Ohio, was a visitor at the Chatham, Ontario, laboratory on February 27.

Dr. E. P. Felt gave a lecture at the New York Botanical Garden on "Insects of Shade Trees and Ornamentals," April 28.

According to *Science*, Mr. W. M. Giffard, amateur entomologist, has been appointed research associate on the staff of the Bishop Museum, Honolulu, H. I.

Dr. P. J. Chapman, assistant in extension entomology at Cornell University, has been appointed entomologist at the Virginia Truck Experiment Station, effective May 15.

Mr. V. I. Safro gave a lecture before the New York Entomological Society, Tuesday evening, May 1, on "Some Interesting Phases of the Japanese Beetle Problem."

Mr. R. A. Blanchard, of the Tempe, Arizona, laboratory of the Bureau of Entomology, has accepted a transfer to take charge of the field laboratory at Sacramento, Calif.

Dr. R. D. Glasgow of the Department of Entomology of the University of Illinois, Urbana, Ill., has been appointed State Entomologist of New York vice Dr. E. P. Felt, retired.

Mr. Morgan Hebard, of the Philadelphia Academy of Sciences, visited the U. S. National Museum on March 29 and 30, and arranged some exchanges of Orthoptera with Mr. A. N. Caudell.

Dr. R. B. Fulton, recently Assistant Chief in Entomology at the Iowa Experiment Station, has moved to Raleigh, N. C., as Research Entomologist at the North Carolina Experiment Station.

Mr. George E. Gould of the University of Kansas was appointed Assistant Entomologist at the Virginia Truck Experiment Station, effective May 1, in the place of Harold S. Peters, who resigned.

On invitation, Dr. David E. Fink, of the Bureau of Entomology, presented a paper on "The Effect of Fluorides and Fluosilicates on the Respiratory Metabolism of Insects" before a symposium on insecticides of the American Chemical Society held in St. Louis, Mo., during April.

At the University of Kansas, a new biological building is being constructed, to be known as Snow Hall, at a cost of $200,000. The department of Entomology will occupy the first floor.

On February 21, Mr. F. T. Cowan, of the Billings, Montana, laboratory of the Bureau of Entomology, attended a meeting held at Fort Collins, Colorado, to discuss control of the Mormon cricket.

Mr. W. A. Thomas, Bureau of Entomology, of Chadbourn, N. C., returned to that place on February 23 after a visit to Green Cove Springs, Florida, to investigate a reported outbreak of the mole cricket.

According to Science, Dr. A. E. Cameron, Professor of Zoology and Entomology in the University of Saskatchewan, has been appointed lecturer in Medical Entomology in the department of Zoology in the University of Edinburgh.

The annual meeting of the British Columbia Entomological Society was held at Victoria on February 25. Messrs. E. R. Buckell, R. Glendenning, and W. Downes from the Entomological Branch attended the meeting and presented papers.

Messrs. B. R. Coad, Dr. J. W. Folsom, Dr. W. V. King, R. C. Gaines, K. P. Ewing, and Dr. F. A. Fenton, of the Tallulah laboratory, Bureau of Entomology, attended the meetings of the Southern Agricultural Workers at Memphis on February 1 and 2.

Dr. George P. Engelhardt, Curator of the Brooklyn Museum of Natural History, visited the Kansas State Agricultural College on April 30. He lectured to the class in Taxonomy concerning taxonomic work in general and his investigations of the Aegeriidae.

According to *Science*, Mr. T. H. C. Taylor, Entomologist of the Department of Agriculture of Fiji, recently visited the fruit-fly laboratory of the U. S. Bureau of Entomology at Ancon, Canal Zone, on his way from Trinidad to Fiji.

Mr. J. W. McGlamery of the Bureau of Entomology, and for more than six years connected with work on the sweet potato weevil in Florida, resigned on March 2 to accept a similar position with the Florida State Plant Board.

Mr. K. B. McKinney, Bureau of Entomology, returned to Clarksville, Tenn. on February 16 from a temporary assignment with the Federal Horticultural Board, and left Clarksville on February 20 for Tempe, Arizona, where he will inaugurate investigations on the tobacco stalk borer.

Mr. W. A. Ross, of the Vineland, Ontario, laboratory, attended a convention of the Ontario Fruit Growers' Association and the Niagara Peninsula Fruit Growers' Association at Hamilton early in March, and spoke on orchard insect conditions in the Niagara district.

Dr. Wilhelm Schaus, U. S. National Museum, was in Boston March 11 to 15 examining various collections of Lepidoptera. He first visited Mr. Weeks, passed an evening with B. Preston Clark, and spent some time studying the collection in the Museum of Comparative Zoology.

Dr. J. M. Swaine, of the Entomological Branch, Ottawa, Canada, delivered a lecture on "Research in Forest Entomology" before the Forestry Club at the University of Toronto on February 24. While in Toronto, Dr. Swaine conferred with Mr. E. J. Zavitz, Deputy Minister of Lands and Forests, concerning cooperative forest insect work during 1928.

Mr. R. A. Cushman of the U. S. National Museum, who went to the Philippines last fall to attend to the packing and shipment of the C. F. Baker collection of insects which had been bequeathed to the Museum, returned to Washington on March 27. The collection is now on its way to the Museum.

On February 4, Mr. Oliver I. Snapp of the Bureau of Entomology gave an address on peach insects at the Mississippi A. & M. College, for the benefit of biological workers and students interested in entomology at that institution. He also attended the meetings of the Cotton States Entomologists in Memphis, Tennessee, February 1–2.

Dr. Adolph Dampf, of the Mexico Department of Agriculture, has been appointed collaborator of the Bureau of Entomology and will assist in the research work on the Mexican fruit worm. His headquarters will be in Mexico City. A temporary laboratory has been constructed at Cuernavaca, Mexico, where certain field work will be conducted.

Mr. E. W. Dunnam, Bureau of Entomology, who for a number of years has been stationed at Florence, S. C., conducting biological investigations on the boll weevil, has been transferred to Tallulah, La., where he plans to continue the same line of work. He will give special attention to the seasonal habits, dispersal, and chemotropic reactions of the weevil.

Dr. F. W. Poos, who has been Entomologist at the Virginia Truck Experiment Station at Norfolk, Virginia, for the past two years, resigned in April to accept a position as entomologist for the U. S. Bureau of Entomology in charge of a new project on the insects which transmit disease to cereal and forage crops, with headquarters at the Arlington Farm, Rosslyn, Virginia.

Dr. L. L. English, who has been working with the Crop Protection Institute doing special investigations with oil emulsions in connection with the control of scale insects, has become a member of the entomological research staff of the Alabama Agricultural Experiment Station, Auburn, Alabama. Dr. English will be located at Springhill, Alabama, doing special work in connection with citrus insects.

Early in February, Mr. F. W. Boyd, of the San Antonio, Texas, field laboratory of the Bureau of Entomology, made a trip through northern Texas to study the effects of the extremely cold weather on green-bugs. He reports that they continue to be abundant near Wichita Falls and in the neighborhood of Denton. So far as he was able to find, the cold weather has had no effect on them.

Mr. B. R. Coad of the Bureau of Entomology attended a meeting in Memphis, Tennessee, on March 30, of commissioners of agriculture, state quarantine officers and state entomologists of the Southern States, called to consider the problem of the pink bollworm in Texas. The sentiment of the meeting was unanimously in

favor of the inauguration, at the earliest practicable time, of a plan for complete eradication of the pink bollworm from the North American continent.

According to *Science*, Dr. H. B. Hungerford of the University of Kansas, left on April 27 for eight months of research work in the museums of Europe. He took with him specimens from the collections of the University of Kansas and the Smithsonian Institution of Washington, D. C., with which he is collaborating on the trip. Dr. Hungerford planned to spend most of the month of May in British museums, going later to Paris, Brussels, Amsterdam, Berlin, Halle, Copenhagen, Prague, Vienna, and Budapest.

Science states that Professor E. O. Essig will conduct a University of California course in field entomology in the Yosemite National Park from May 14 to June 24, having headquarters at the new Yosemite Park Museum. During July he will be at his permanent summer camp at Echo Lake, in the High Sierras, 7500 feet altitude, eleven miles from Lake Tahoe, where he will be glad to assist visiting entomologists in relation to the various types of entomological work being carried on in the region.

Mr. B. L. Boyden, Associate Entomologist, Bureau of Entomology, formerly in charge of the sweet potato weevil work in Florida, and who has been employed by the Division of Truck Crop Insect Investigations in various assignments since 1914, was transferred to the Federal Horticultural Board, on February 1, 1928, to take charge of the work on eradication of the date scale at Indio, California. Mr. Boyden's selection for this difficult assignment was a recognition of the very effective work conducted under his direction in connection with the sweet potato weevil in Florida.

Dr. C. A. Weigel, Bureau of Entomology, returned late in March from a month's trip to the Pacific Coast, in the course of which he conferred with Dr. F. R. Cole of Santa Cruz, California, and C. F. Doucette of Puyallup, Washington, in regard to the work of the field laboratories at those places on bulb flies and other pests of narcissus and other flowering bulbs. While on the Pacific Coast, Dr. Weigel attended the fifth annual convention of the Northwest Florists' Association, held March 4–6 at Vancouver, B. C., and gave an address on "Insect Pests of Florists' Stock Grown under Glass." He also discussed the subject of "Bulb Insects and Their Control" before the Bulb Growers' section of the association at a meeting held in conjunction with the parent organization.

A meeting of officials in charge of gipsy moth control work in the infested states was held at the State Capitol, Hartford, Conn., May 21, to discuss gipsy moth conditions and plans of work for the coming year. Dr. W. E. Britton acted as chairman and called for a report from each state represented, and Mr. Burgess reported for the Bureau of Entomology. The following were present: W. G. Howard, H. L. McIntyre, Saul Phillips, Conservation Department, Albany, N. Y.; Dr. Thomas J. Headlee, State Entomologist, New Brunswick, N. J.; Dr. T. L. Guyton, Bureau of Plant Industry, Harrisburg, Pa.; Harold L. Bailey, State Department of Agriculture, Bradford, Vt.; W. A. Osgood, State Department of Agriculture, Durham, N. H.; E. L. Newdick, State Department of Agriculture, Augusta, Maine; George A. Smith, Grover C. Twiss, Conservation Department, Boston, Mass.; Harry Horovitz, Alvin J. Lannon, Department of Agriculture, Providence, R. I.; A. F. Burgess, S. S. Crossman, H. L. Blaisdell, John N. Summers, H. B. Dalton, Federal Bureau of Entomology, Melrose Highlands, Mass.; Dr. W. E. Britton, State Entomologist, New Haven, John T. Ashworth, Danielson, and J. A. McEvoy, Putnam, Conn.

Notes on Horticultural Inspection

On February 6, Mr. Orlando G. Fitzgerald was appointed as Junior Plant Quarantine Inspector at New York City.

Mr. Kirby W. Holloway was reinstated as Junior Plant Quarantine Inspector at the port of New York on March 8.

Mr. M. J. Forsell, Junior Plant Quarantine Inspector at Seattle, Wash., recently inspected bulbous iris imported under special permit in California.

Mr. Freemont A. Ballou, who was appointed on October 15, 1927, as Junior Plant Quarantine Inspector at Douglas, Arizona, resigned on April 30, 1928.

Mr. Lee A. Strong, Assistant Director of Agriculture of California, was in Washington early in April to confer with members of the Federal Horticultural Board.

Mr. James C. Moore, Junior Plant Quarantine Inspector, was recently transferred from the New York Office of the Federal Horticultural Board to Transportation and Storage Investigations of the Bureau of Plant Industry.

Mr. Morris F. Hartman died at his home in Cincinnati, Ohio, on April 17, after a short illness. Mr. Hartman had been employed at New York as Plant Quarantine, Inspector since November 10, 1924.

On February 8, Mr. R. W. Nicaise was transferred from New Orleans, Louisiana. to San Juan, Porto Rico, to fill the vacancy caused by the transfer of Mr Geraldus Gay to New Orleans, Louisiana, on March 3, 1928.

Mr. L. M. Scott and Mr. A. J. Bruman, of the Washington office of the Federal Horticultural Board, spent the month of April in inspecting narcissus and bulbous iris and other special permit material in the States of Virginia, North Carolina, South Carolina, Georgia and Tennessee.

Dr. S. B. Fracker, Senior Plant Quarantine Administrator in charge of domestic plant quarantine work for the Federal Horticultural Board, left Washington April 29, for Texas, New Mexico and Arizona, for the purpose of aiding in the administration of the pink bollworm quarantine.

Mr. Costillo Graham, a graduate of Mississippi A. & M. College, and Mr. W. T. Henerey, have been appointed to graduate assistantships in the Maryland State Horticultural Department and have entered upon such duties. Mr. Graham at present is engaged in Spray Service work and Mr. Henerey in soil treatment for the control of the Japanese beetle.

California issued Pest Control Regulation No. 3 (Revised), effective March 12, 1928, pertaining to the vegetable weevil. Under that regulation any of the host plants of the weevil shipped intrastate from the counties designated as infested must be inspected on arrival at destination by a California horticultural inspector.

Quarantine Circular No. 3 (New Series—Revised) pertaining to the cherry fruit fly (*Rhagoletis cingulata*) in certain counties in Washington was made effective on and after May 3, 1928. The fruit fly is known to be present in the Counties of Clarke, King, Pierce, Whatcom, and Whitman, in the State of Washington.

A California quarantine inspector recently intercepted a shipment of the following plants from Massachusetts: cut flowers, moss, evergreens, five-leafed pines, and willow scions. This shipment not only violated the gipsy moth and satin moth quarantines, but also the blister rust quarantine, and possibly the corn borer quarantine.

Reports received from the scouting staff engaged in examining areas in western Nova Scotia which have been infested by the brown-tail moth are encouraging. This insect has been established in Nova Scotia since 1906, but owing to spraying, natural control activities, and the destruction of winter nests, the infested area has been reduced each year. This season, up to the present time, no signs of the pest have been discovered.

Mr. E. C. Mandenberg, State Inspector of Orchards and Nurseries for the Michigan Department of Agriculture, writes: "Michigan is planning a drive early this year in connection with the raspberry mosaic. We hope to cover the entire raspberry acreage in the State from which plants will be taken before many of the aphids hatch out. There are no changes in our staff, but all the men who will be on the work will be men who have been in the service at least two years and longer."

An announcement made on March 14 by the Plant Board of Mississippi states that a regulation has been established effective on that date, governing the sale of certified (Irish) seed potatoes. The regulation prohibits sale of seed potatoes as "certified," "registered" or "inspected" stock unless by tags, certificates or other equally satisfactory evidence it is shown that the seed has been inspected and certified by the legally constituted certification authorities in other States, or by such other agencies as the Mississippi State Plant Board may approve.

The 10th annual conference of the Western Plant Quarantine Board will meet at Salem, Oregon, July 12, 13 and 14. This Board, as can be indicated by the number of its annual conferences, is the pioneer of the regional plant boards and promises to develop a very interesting program for its session. In addition to representatives from the eleven western States, British Columbia, Hawaii, and the Northern State of Lower California, there are always in attendance interested parties from all over the United States. This year two of the leaders in quarantine and pest suppression in the Republic of Mexico will meet with the Board.

Inspection to enforce the federal domestic plant quarantines in such terminal transfer points as Chicago, Kansas City, Omaha, and St. Paul, has been stopped for the spring shipping season at all points except in Chicago. Numerous violations, especially of the white pine blister rust, Japanese beetle, gipsy and brown-tail moths, satin moth, and black stem rust quarantines were intercepted. During the week of April 8, Dr. W. A. McCubbin, Pathologist, Department of Agriculture, Harrisburg, Pa., Mr. E. L. Chambers, State Entomologist of Wisconsin, Mr. F. D. Winter, Chief Deputy Nursery Inspector of Minnesota, and Mr. P. A. Eastman, Assistant Director, Bureau of Plant Industry of New York, were present in Chicago and inspected the methods of work. Doctor McCubbin, in commenting on the inspection, wrote: "I hope that that work, which is developing in such splendid manner, will be continued and enlarged until it forms a network of connecting type covering the channels of trade in such a way as to practically eliminate the danger of insect and plant disease spread through these trade channels."

According to Mr. L. A. Whitney, Associate Plant Inspector, Honolulu, Hawaii, a rice borer (*Chilo*, perhaps *oryzae*) was discovered during February affecting about 125 acres of growing rice. A preliminary survey determined that the borer is present in about 1,000 acres at the present time (April 5, 1928) and is apparently confined to Oahu. Larvae of the moth have been intercepted in rice straw packing from Japan on two occasions recently. All straw packing of imported merchandise is

being removed and burned. An endeavor is being made to confine the infestation to Oahu by aid of a very stringent rule prohibiting the movement of rice straw or rice plants from that Island to others of the group. Mr. Fullaway left Honolulu March 22 for Japan where he is searching for natural enemies of the rice borer. Mr. Whitney also writes that the first recorded interception in Hawaii of the European earwig was made in a shipment of oak cordwood from Seattle. Since the interception all such shipments have been fumigated with carbon bisulphide as a condition of entry.

Apicultural Notes

The spring meeting of the Connecticut Beekeepers Association was held at Hartford, April 28. The principal speaker was Professor R. B. Willson of New York.

Dr. J. W. Bulger has been transferred from the Bee Culture Laboratory to the Washington office of the Bureau of Entomology with the rank of associate entomologist, where he will be engaged in compiling an insecticidal pharmacopœia in the Office of Deciduous Fruit Insect Investigations.

Recent visitors at the Bee Culture Laboratory of the Bureau of Entomology were: Lieut. Gen. Phya Vijitavongs, Minister to the United States from Siam, who visited the Laboratory in the interest of the development of bee culture in his native country, and Professor Herbert Osborn, Department of Entomology and Zoology, Ohio State University, Columbus, Ohio.

At the recent Indianapolis meeting of the Bee Industries' Association of America there was formed the "American Honey Institute." The object of this institute is to provide more educational publicity for honey so that its market may be increased. Dr. H. E. Barnard, who was formerly connected with the American Bakers' Association, is in charge of this new agency.

Mr. E. L. Sechrist, of the Bee Culture Laboratory of the Bureau of Entomology, left Washington early in April to spend several months in the Intermountain States, where a cooperative investigation is being carried on with the Bureau of Agricultural Economics in connection with a study dealing with the cost of honey production and systems of apiary management. About forty commercial apiaries in the States of Colorado, Wyoming, Utah, Montana, and Idaho will be used for obtaining data. Mr. R. S. Kifer, of the Bureau of Agricultural Economics, is expected to join Mr. Sechrist to assist with the work. Mr. C. L. Corkins, State Entomologist, Laramie, Wyoming; Mr. R. G. Richmond, Deputy, Apiary Inspection, Fort Collins, Colorado; Mr. D. H. Hillman, State Inspector of Apiaries, Salt Lake City, Utah; and Mr. O. A. Sippel, State Apiarist, Bozeman, Montana, are giving valuable assistance in this work.

Notes on Medical Entomology

Mr. C. B. Philip has recently accepted an appointment to investigate the yellow fever situation in central Africa on behalf of the Rockefeller Foundation.

Professor R. A. Cooley of the Montana State College and Station is now absent on a trip to Europe and Africa for the purpose of studying the parasites of ticks.

Mr. Robert C. Botsford, Connecticut Agricultural Experiment Station, has recently been called to Martha's Vineyard, Mass., and to Rye Beach, N. H., to advise regarding mosquito elimination from the rather large areas of salt marsh there.

According to *Science*, the degree of doctor of laws was recently conferred by Tulane University upon Dr. Aristides Agramonte of Havana, who was a member of the group of army officers—Reed, Carroll, Lazear, and Agramonte—which was appointed by the United States to conduct yellow fever investigations in Cuba soon after the Spanish War.

At the twenty-fourth annual meeting of the American Society of Tropical Medicine held in Washington May 1–2, several speakers touched on the subject of insects in relation to disease. The entomological profession was represented by Dr. L. O. Howard, Bureau of Entomology, and Dr. William A. Riley, University of Minnesota.

Dr. Hideyo Noguchi, member of the Rockefeller Institute for Medical Research, and Dr. William Alexander Young, Director of the Gold Coast Medical Research Institute of Yellow Fever, have died in Africa from African yellow fever contracted while investigating the disease. Dr. Noguchi died May 21, aged 51 years. Dr. Young was 39 years of age, and his death was announced in a dispatch from London, May 30.

Mr. D. C. Parman of the Division of Insects Affecting Man and Animals, Bureau of Entomology, spent the greater part of April in the Coachella and Imperial Valleys of California, studying the possibilities of trapping the gnats (*Hippelates* spp.), which are causing serious annoyance there. As a result of this work a trap was devised which shows considerable promise, as great numbers of the gnats were attracted and captured.

Mr. F. C. Bishopp, in charge of the Division of Insects Affecting Man and Animals, Bureau of Entomology, spent the greater part of April making a survey of the present status of the cattle grub in the north central states and conferring with entomologists and veterinarians at Kansas State Agricultural College, Kansas University, Iowa State College, University of Minnesota, and North Dakota Agricultural College regarding this and other problems relating to insects affecting live stock and poultry.

Dr. W. V. King of the Division of Insects Affecting Man and Animals, Bureau of Entomology, addressed the sixth annual meeting of the Florida Anti-mosquito Association at Jacksonville, March 29, on the subject of malarial mosquito control. Following this meeting, Dr. King, accompanied by Dr. Williams and Dr. Griffiths of the Public Health Service, visited a power project near Tallahassee, Florida, where water is being impounded over a large area. This visit was for the purpose of advising the local authorities concerning the mosquito breeding problems on the project and the possible utilization of airplanes in distributing insecticides for their control.

Erratum

Page 344, current volume, the legend of Fig. 22 should read "caught in 300 pails."